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NOTICE
TO STUDENTS

FLOWERING PLANTS

J. E. O. Garnett

TREES

A. Leaves compound (Pl. II).

- Leaves once pinnate (Pl. II, fig. 1).
 - Leaflets without glands at the base.....Family 7
 - Leaflets with glands at the base.....Family 29
- Leaves twice (or more) pinnate (Pl. II, fig. 8).
 - Plants thornyFamily 23
 - Plants not thornyFamily 31

B. Leaves simple (Pl. I).

- Leaves opposite (Pl. III, fig. 5).....Family 52
- Leaves alternate (Pl. III, fig. 6).
 - Margin of leaf entire, or nearly so (Pl. III, fig. 1).
 - Leaves cordate, fruit a pea pod (Pl. I, fig. 1). Family 24
 - Leaves ovate, fruit a drupe (Pl. I, fig. 2) Family 10
 - Leaves ovate, fruit orange-like, large, (Pl. V.
fig. 1)Family 11
 - Margin of leaf serrate or lobed (Pl. III, figs.
2 and 3).
 - Plants thornyFamily 22
 - Plants not thorny.
 - Leaves deltoid in general outline,
(Pl. I, fig. 5)Family 8
 - Leaves not deltoid.
 - Leaves ovate, serrate (Pl. I, fig. 2,
Pl. III, fig. 2).....Family 10
 - Leaves lobed, not serrate (Pl. III, fig. 3)
 - Lobes rounded in outline (Pl. III,
fig. 3)Family 9
 - Lobes angular (Pl. III, fig. 4).....Family 20

HERBS, SHRUBS, OR VINES

Division I MONOCOTYLEDONS. Plants with flowers on the plan of 3 (or multiples of 3), Pl. VII, figs. 1 and 2; with leaves parallel veined, Pl. I, figs. 10 and 11; stems not provided with concentric growth rings.

Perianth free, or united only at the base of the ovary.

- Perianth in 2 series, the outer sepal-like (Pl. VII, fig. 1) . Family 1
- Perianth segments alike and petaloid (Pl. VII, fig. 2,
Pl. IX, fig. 1).
 - Herbs or shrubsFamily 2
 - Spiny vinesFamily 3

Perianth attached to the ovary (Pl. IX, fig. 10).

Stamens 1 or 2.....	Family 6
Stamens 3	Family 5
Stamens 6	Family 4

Division 2. DICOTYLEDONS. Plants with the flowers on the plan of 4 or 5 (Pl. VII, Figs. 3 and 4); leaves netted veined (Pl. I, fig. 12); stems showing concentric growth rings.

Apetalous. Flowers with no corolla. (Although the calyx may be colored and petal-like, Pl. VII, fig. 5).

Flowers in dense bunches, plants parasitic on other plants.	Family 13
Flowers not in dense bunches. Calyx parts petal-like.	

Ovary superior, 1-celled.....	Family 12
Ovary superior, 3-celled (Pl. VII, fig. 5)	Family 33

Polypetalous. Calyx and corolla both present. Petals not united. (Pl. VII, fig. 6).

A. Stamens more than 10:

1. Shrubs or vines.

Plants leafless, stem fleshy and thorny (Pl. V, fig. 7)	Family 36
Plants leafy, stem not fleshy.	

Ovary 1, simple.

Fruit a pea pod (Pl. IV, figs. 1 to 4)	Family 23
Fruit a drupe (Pl. V, fig. 3)	Family 21

Ovaries numerous.

Trailing vines or shrubs with sharp spines..	Family 21
Climbing vines without spines.....	Family 17

2. Herbs.

Ovaries several, simple (Pl. VI, fig. 7).

Stamens on the receptacle (Pl. IX, fig. 6)	Family 16
Stamens on the calyx (Pl. IX, fig. 7)	Family 21

Ovary compound (Pl. VI, figs. 8 and 9).

Stamens distinct (Pl. IX, fig. 4)	Family 18
Stamens united (Pl. IX, fig. 5).....	Family 34

B. Stamens not more than 10:

1. Shrubs or vines.

Stamens distinct, flowers small and in dense heads	Family 30
Stamens united in 1 or 2 groups, flowers pea-like, (Pl. VIII, fig. 1)	Family 25

2. Herbs.

Ovary single, 1-celled.

Corolla regular or nearly so.

- Leaves alternate Family 24
- Leaves opposite Family 15

Corolla irregular.

- Fruit a pod, flowers pea-like (Pl. VIII,
fig. 1) Family 25
- Fruit a capsule, flowers not pea-like.

 - Stamens 5 Family 35
 - Stamens 6, in two groups (Pl. VIII,
fig. 4) Family 18

Ovary single, 2-5-celled.

- Ovary 2-celled.

 - Flowers in umbels (Pl. IX, figs. 2 and 3) Family 38
 - Flowers not in umbels (Pl. IX, figs. 5,
6 and 7) Family 19

Ovary more than 2-celled.

- Ovary a 4-celled capsule, flowers 4-petaled. Family 37
- Ovary a 5-celled capsule, flowers 5-petaled.

 - Fruit with an elongated beak (Pl. IV,
fig. 12) Family 26
 - Fruit without an elongated beak (Pl. IV,
fig. 10).
 - Juice sharply acid Family 27
 - Juice not acid (Pl. VII, figs.
4 and 5) Family 28

Gamopetalous. Calyx and corolla both present. Petals
more or less united. (Pl. VII, fig. 7.)

A. Shrubs or herbs with woody roots.

- Flowers pea-like (Pl. VIII, fig. 1).
- Fruit a pod (Pl. IV, figs. 1 to 4) Family 25
- Fruit not a pod (Pl. V, fig. 5) Family 32

Flowers not pea-like.

- Fruit a 2-celled many-seeded capsule Family 49
- Fruit small drupes, arranged in fours (Pl. V,
fig. 4) Family 46

B. Herbs or vines.

1. Ovary superior (Pl. IX, fig. 9).
 - a. Flowers regular.

 Ovary in two distinct parts.

- Flowers blue Family 40
- Flowers orange, green or purple Family 41

 Ovary not in two distinct parts.

Ovary 1-celled.

Fruit a pod Family 23

Fruit not a pod.

Leaves alternate (Pl. III, fig. 6) . . . Family 44

Leaves opposite (Pl. III, fig. 5) . . . Family 39

Ovary 2-several-celled.

Ovary deeply 4-lobed Family 46

Ovary not deeply lobed.

Cells of ovary 1 or 2-seeded.

Flowers yellow Family 45

Flowers pink, white or blue Family 42

Cells of ovary several-seeded.

Stigma simple (Pl. IX, fig. 11) . . . Family 48

Stigma 3-lobed (Pl. IX,
fig. 12) Family 43

Stigma 5-lobed (Pl. IX,
fig. 13) Family 27

b. Flowers irregular (Pl. VIII).

Flowers pea-like, ovary 1-celled, a pea-pod,
(Pl. VIII, fig. 1) Family 25

Flowers not pea-like; ovary 1, 2 or 4 cells.

Ovary a 1-celled, elongated capsule Family 18

Ovary 2-4 cells.

Cells each 1-seeded

Ovary deeply 4-lobed, plant stems
square, (Pl. V, fig. 6) Family 47

Ovary not deeply lobed.

Stamens 4 Family 46

Stamens 8 Family 32

Cells each several seeded.

Plants green Family 49

Plants without chlorophyll Family 50

2. Ovary inferior (Pl. IX, fig. 8).

Flowers in an involucrate head (Composites,
(Pl. VIII, figs. 5 to 9) Family 56

Flowers not in heads.

Stamens 3.

Leaves alternate.

Flowers yellow, large. Plants are
trailing vines Family 54

Flowers purple, small. Plants erect. . Family 55

Leaves opposite, flowers white and small. Family 53
 Stamens 4 or 5. Flowers pink, petals 4 . . . Family 51

FAMILY 1 (Commelinaceae)

1. *Commelina crispa*. Day flower. Petals blue, unequal, two large and one small. Leaf blades lanceolate. Leaf sheaths thin, pale. Late.
2. *Tradescantia humilis*. Spiderwort. Petals 3, equal, blue. Sap *o*
this slimy and viscid. (Pl. VII, fig. 1.)

FAMILY 2 (Liliaceae)

Plants with a woody root, no bulb *Yucca*
 Plants with bulbs or corms.

Flowers umbelled (Pl. IX, fig. 1).

Perianth 6-parted.

Odor distinctly onion-like *Allium*

Odor not onion-like *Nothoscordum*

Perianth funnel-form *Androstephium*

Flowers not umbelled.

Low herbs, leaves only 2 and mottled *Erythronium*

Tall herbs, leaves many *Quamasia*

3. *Yucca arkansana*. "Spanish Dagger." Bear grass. Leaves linear, spike-like. Plants low and bushy, bearing flowers on a tall spike. Flowers white, large. Late.

this 4. *Allium helleri*. Wild garlic. Wild onion. Flowers in dense umbels, white or pinkish in color. Odor of plant garlic-like. Early.

5. *Nothoscordum bivalve*. Wild onion. Crow poison. Flowers white, cream or greenish. Common. Early.

6. *Androstephium ceruleum*. "Wild hyacinth." Plants small and obscure, growing usually on rocky hillsides. Flowers lilac to violet in color, fragrant. Early.

7. *Erythronium albidum coloratum*. Adder's tongue. Dog toothed violet. Flowers rather large, white, sometimes lavender. Leaves conspicuously mottled with brownish red. Early.

8. *Quamasia hyacinthifolia*. Quamash. Wild hyacinth. Flowers varying from white to blue. Odor distinctly hyacinth-like. Plants often grow in clumps.

FAMILY 3 (Smilaceae)

9. *Smilax bona-nox*. Bristly Greenbriar. Cat-briar. Stems trailing or climbing. Armed with spines. Leaves deltoid in shape, smooth

on both sides, sometimes bearing small spines on the margins. Extremely common in deep woods. Early.

FAMILY 4 (Amaryllidaceae)

10. *Cooperia drummondii*. Rain lily. Flowers white, sometimes tinged with purple, salver form. Perianth with 6 spreading parts united into a tube. Plants blossom 48 hours after a rain. Late.

FAMILY 5 (Iridaceae)

11. *Nemastylis acuta*. Flowers large, blue. Petals 3; stamens 3, yellow large. Leaves narrow and folded lengthwise. Fruit a capsule.
12. *Sisyrinchium amoenum*. Blue-eyed grass. Flowers small, blue. Plants quite grass-like in appearance. (Pl. VII, fig. 2.)

FAMILY 6 (Orchidaceae)

13. *Ibidium gracile*. (*Gyrostachys gracilis*, *Spiranthes*). Ladies' tresses. An orchid. Pale greenish white flowers arranged in a spiral spike. Leaves shriveling quickly. Often common along the "River Road" northwest of the campus. Late.

FAMILY 7 (Juglandaceae)

14. *Hicoria pecan*. Pecan. Large, slender and graceful tree. Leaves compound. Fruit a nut inclosed in a fleshy husk.

FAMILY 8 (Salicaceae)

15. *Populus deltoides*. Cottonwood. Large tree. Bark grayish green, deeply furrowed in old age. Trees are in two sexes, the "male" (staminate) being the more common. Leaves deltoid in shape, more or less cottony beneath. (Pl. I, fig. 5.)

FAMILY 9 (Fagaceae)

Acorn cups deep and hemispheric.

 Acorn cup with a mossy lip. Cup almost enclosing
 the nut *Q. macrocarpa*

 Acorn cup without mossy lip *Q. marylandica*

 Acorn cup shallow and saucer shaped.

 Cups small, averaging $\frac{1}{2}$ inch or less *Q. nigra*
 Cups large, averaging 1 inch or more *Q. schneckii*

16. *Quercus macrocarpa*. Burr oak. Mossy cup oak. Leaves large, 5 to 8-lobed, dark green and smooth above, white and hairy beneath. Acorn large and mossy. (Pl. III, fig. 3.)

17. *Quercus marylandica*. Black jack oak. Leaves broad at the apex,

2 to 5-lobed, dark green and shiny above, brown and hairy beneath.

18. *Quercus nigra*. Water oak. A very large spreading tree found near the water. These trees mark the water courses of the entire Southwest. Leaves large, usually lobed at the apex, green and shining on both sides, spatulate. (Pl. I, fig. 6.)

19. *Quercus schneckii*. Spanish oak. Red oak. A small tree. Leaves deeply lobed, 5 to 7 lobes.

FAMILY 10 (Ulmaceae)

20. *Celtis mississippiensis*. Hackberry. A large tree. Leaves ovate, slightly serrate. (Pl. I, fig. 2.) Bark smooth, but broken by prominent corky ridges on old wounds. Fruit a small hard-seeded drupe.

21. *Ulmus crassifolia*. Scrub elm. very common small tree. Leaves small, thick, elliptic, serrate, often doubly serrate. Can be distinguished from *U. alata* by the absence of cork wings on the twigs. (Pl. I, fig. 7.)

22. *Ulmus alata*. Winged elm. Cork elm. Small tree, like the above, but with many of the twigs provided with flat corky ridges or "wings."

FAMILY 11 (Moraceae)

23. *Toxylon pomiferum*. Osage orange. Bois d'arc. Trees small. Fruit large and spheroidal. (Pl. V, fig. 1.) Stem and twigs with many sharp spines. Sap milky, sticky. Late.

FAMILY 12 (Urticaceae)

24. *Urtica chamaedryoides*. Small stinging nettle. Small herbs. Plant armed with scattered stinging bristles. Leaves ovate to lanceolate, leaf margins serrate. Flowers small, greenish.

FAMILY 13 (Loranthaceae)

25. *Phoradendron flavescens*. Mistletoe. Small plants, parasitic on trees. Conspicuously green in winter. Fruit a small white berry.

FAMILY 14 (Aizoaceae)

(Representatives of this family are omitted from this edition.)

FAMILY 15 (Caryophyllaceae)

26. *Silene antirrhina*. "Chickweed." Sleepy catchfly. Plants small and covered with minute hairs. Flowers small, white. Calyx bell-shaped or tubular.

27. *Alsine media*. Chickweed. Plants small, branching freely from the base. Leaves heart-shaped. Petals white, deeply 2-cleft, and about one-half length of the green sepals. Common in front of Main building on campus, in early Spring.

FAMILY 16 (Ranunculaceae)

Procumbent herbs or vines Viorna
Erect herbs.

Flowers small and "daisy-like" (Pl. IX, fig. 6) Anemone

Flowers large and spur-shaped Delphinium

28. *Viorna simsii*. Clematis. Leather flower. Flowers purple. Leaf blades pinnate. Stem a climbing vine. Late.

29. *Anemone decapetala*. Anemone. Wind flower. "Daisy." Small plants. Flowers $\frac{1}{2}$ inch or more in diameter, white to purplish. 10-20 petal-like sepals. Early.

30. *Delphinium albescens*. Larkspur. Tall plants. Flowers white to blue, with 5 irregular petal-like sepals, the upper one prolonged into a spur.

FAMILY 17 (Menispermaceae)

31. *Cebatha caroliniana*. Moonseed. Coral Bead. A climbing vine with conspicuous red berries, the seeds of which are coiled spirally. Late.

FAMILY 18 (Papaveraceae)

32. *Argemone platyceras*. Mexican poppy. Flowers large, white. Plants covered with sharp spines. Sap abundant and yellow in color. Late. (Pl. IX, fig. 4.)

✓ 33. *Capnoides aureum*. Golden corydalis. Flowers yellow and with short spurs. Fruit a slender pod. Plants small and usually rather pale. Early. (Pl. VIII, fig. 4.)

FAMILY 19 (Cruciferae)

Flowers yellow Lesquerella
Flowers white.

Seed pods triangular or heart-shaped Bursa

Seed pods saber-like Draba

Seed pods circular and arranged in "terraces" Lepidium

34. Lesquerella gracilis. Wild mustard. Slender Bladder pod. Flowers yellow. Petals 4. Seed pods globose. Plants very abundant. Early.

35. *Bursa bursa-pastoris*. Shepherd's purse. Plants small, branching.

Leaves deeply incised. (Pl. I, fig. 8; Pl. IV, fig. 5.) Flowers small, white, 4-petaled. Early.

36. *Draba cuneifolia*. Alpine mustard. Whitlow grass. (Pl. IV, fig. 6.) Very small plants, erect, hairy. Minute white flowers. These are often the first flowers of the season. Early.

✓37. *Lepidium virginicum*. Peppergrass. Flowers small, white, 4-petaled. Seed pods flat and circular and arranged along the stem in irregular flat layers. (Pl. IV, fig. 7.)

FAMILY 20 (Platanaceae)

38. *Platanus occidentalis*. Sycamore. A large tree, with coarse leaves. Fruit a peculiar fluffy ball. Outer bark often peels off rapidly, giving a characteristic naked appearance to the tree. (Pl. III, fig. 4.)

FAMILY 21 (Rosaceae)

39. *Rubus trivialis*. Dewberry. Trailing shrubs. Plants covered with small thorns. Flowers large, white, many petaled. Fruit resembles that of the blackberry. Early. (Pl. IX, fig. 7.)

40. *Rosa foliosa*. Wild rose. Low erect shrubs. Flowers white, solitary, many petaled. Fruit globose, the calyx persisting. Late.

41. *Prunus angustifolia*. Creek plum. Sand plum. A woody shrub, growing in clumps. Flowers white, fragile, fragrant. Fruit a reddish plum. Early. (Pl. V, fig. 3.)

FAMILY 22 (Pomaceae)

✓42. *Crataegus spathulata*. White haw. Hawthorne. A small tree, with stout spines. Leaves fairly large and smooth. Sometimes faintly 3-lobed, margins serrate above the middle. Flowers conspicuous, white. Fruit a reddish plum. Early.

FAMILY 23 (Mimosaceae)

Trees or tall shrubs *Prosopis*
Herbs.

Flowers yellow *Neptunia*
Flowers not yellow.

The minute spines, covering plant, hooked *Morongia*
Spines not hooked *Acuan*

43. *Prosopis juliflora*. Mesquite. A small tree. Stem thorny. Fruit a pod.

44. *Neptunia lutea*. Small yellow flowers in round heads. Leaves only slightly sensitive, but this is usually considered one of the sensitive plants.

glo 45. *Morongia uncinata*. Sensitive plant. Sensitive Briar. Pink to purple minute flowers in globular heads. Leaves extremely sensitive. The true sensitive plant of this region.

46. *Morongia angustata*. Sensitive plant. Like the above, but flowers white. Much less sensitive than the above.

47. *Acuan illinoensis*. Flowers minute, white to purple in globose heads. Pods in dense heads, are flatter and more curved than those of Morongia and the plants are much less sensitive.

FAMILY 24 (Caesalpinaeae)

48. *Cercis occidentalis*. Red bud. Judas tree. A small tree. Flowers rose colored, numerous, appearing before the leaves. Fruit a pea pod. Leaves cordate. Early. (Pl. I, fig. 1.)

49. *Cassia chamecrista*. Partridge pea. Sensitive pea. Senna. An herb with compound slightly sensitive leaves. Leaf stems have small bait cups or nectaries at the base. (Pl. II, fig. 10.) Flowers yellow, slightly irregular. Late.

Wyo 50. *Cassia romeriana*. Partridge pea. Senna. Distinguished from the above by the leaves, which have only two leaflets each. (Pl. II, fig. 9.)

FAMILY 25 (Papilionaceae)

Flowers pink or rose.

Fruit a globose "plum," flowers pale pink (sometimes times lavender) Astragalus

Fruit not plumlike.

Plants erect, flowers deep rich rose. Oxytropis

Plants not erect, but trailing or low-growing.

Plants with bulb-like root, flowers fragrant. . . . Psoralea

Plants trailing, with forking tendrils at ends of

the leaves Vicia

Flowers blue.

Plants with palmately compound leaves (Pl. II, fig. 3), flowers rather large, bright blue, the well-known "Blue Bonnet" Lupinus

Plants with pinnately compound leaves.

Leaves ending in a single leaflet. Astragalus

Leaves ending in forking tendrils (Pl. II, fig. 2) Vicia

Flowers purple.

Plants small, 1 foot or less in height. Petalostemon

Plants large, 2 to 4 feet, flowers bright, bluish purple

leaves 3 or 5-parted usually. Psoralea

51. *Astragalus crassicarpus*. (*Geoprumnon crassicarpum*). Ground

plum. Low, trailing plants, appearing very early. Flowers pale, shading from pink to lavender. Fruit a thick pod, fleshy and globose, distinctly plum-like in appearance.

52. *Astragalus nuttalianus*. Small, erect plants, with bright blue, rather minute flowers. Very common on the north end of the campus in Spring. Seed pods about $\frac{3}{4}$ inch in length, when ripe are almost black in color, with a V-shaped groove the length of the pod. (Pl. IV, fig. 2.)

53. *Oxytropis lamberti*. (Aragallus.) Flowers conspicuous, rose-colored, in short spikes. Leaves pinnately compound, mostly basal, covered with grayish hairs. Seed pods keeled. One of the less important "loco" weeds.

54. *Psoralea hypogea*. Small, low-growing plants, flowers in small dense heads, resembling clover and very fragrant. Leaves basal and palmately compound. Root hard, round and bulb-like.

55. *Psoralea rhombifolia*. Plants rather large, about 2 feet and spreading. Flowers bright bluish purple, in "heads," frequently mistaken for Texas Blue-bonnet. (The stem growth of this plant is markedly different from the Blue-bonnet, and only the most casual observer should ever mistake the two.)

56. *Psoralea cuspidata*. Tall, slender, branching plants, 2 to 4 feet. Flowers small, inconspicuous, dark purple in color. Leaves usually 3-parted, few in number.

57. *Lupinus texensis*. Texas Blue-Bonnet. The official flower of the State of Texas. Unfortunately, it is not common around the campus, but grows in great abundance in the region around Lake Worth, and on the rolling uplands southwest of Benbrook. Flowers rich blue, leaves palmately compound. Plants usually less than 1 foot high, occurring in dense clumps covering acres of ground.

58. *Vicia leavenworthii*. Vetch. Small plants branching from the base. Flowers pink, the standard frequently striped with darker veins of color. Flowers numerous, on short stems, growing in the axils of the leaves. Seeds borne in flattened pods.

59. *Vicia texana*. Like above, but flowers bluish, and borne on the end of the small flower stalk, usually not more than three or four in number. Pods flattened.

60. *Petalostemon tenuifolius*. Prairie clover. This plant is difficult to recognize as a member of this family, because it lacks the characteristic pea-shape of the blossoms. The flowers are in dense, small heads, those at the base blooming first, and the unopened buds

arranged around the peduncle to give the effect of an elevated cone.

FAMILY 26 (Geraniaceae)

61. *Erodium cicutarium*. Pin clover. Small plants, hairy with pinnately dissected leaves. (Pl. II, fig. 5.) Flowers about $\frac{1}{4}$ to $\frac{1}{2}$ inch and bright rose color.
62. *Erodium texanum*. Stork bill. Wild geranium. Small plants, slightly hairy, with palmately-lobed leaves. (Pl. II, fig. 6). Flowers fairly large, about 1 inch, and deep rose in color.
63. *Geranium texanum*. Wild geranium. Crane's bill. Plants small, spreading. Leaves palmately lobed, lobes dissected. (Pl. II, fig. 7). Flowers small, pale pink, about $\frac{1}{4}$ inch across.

FAMILY 27 (Oxalidaceae)

- ✓ 64. *Oxalis violacea*. Blue sour grass. Small plants with sharp acid juice. Leaves trifoliate. (Pl. II, fig. 4). Flowers blue to purple.
- ✓ 65. *Xanthoxalis stricta*. (Oxalis). Sheep sorrell. Like above, but flowers smaller and yellow. Fruit a slender capsule. (Pl. IV, fig. 9.)

FAMILY 28 (Linaceae)

- J* ✓ 66. *Linum lewisii*. Blue flax. Small plants with frail blue flowers, which are on a perfect "plan of five." Petals shed off readily. (Pl. VII, fig. 4.) Early
67. *Carthotinum berlanderi*. Yellow flax. Much like the above, but flowers are larger and yellow. (Pl. VII, fig. 6.)

FAMILY 29 (Simarubiaceae)

68. *Ailanthes glandulosus*. Tree of Heaven. Trees with a smooth, pale bark. No small twigs present, giving a characteristic naked appearance. Leaves large, compound, with many leaflets. Leaflets with glands at the base. These trees are in two sexes, the "male" (staminate) having an unpleasant odor. Late.

FAMILY 30 (Rhamnaceae)

- ✓ 69. *Ceanothus ovatus*. Red root. A smooth shrub with narrow elliptic leaves. Flowers small and in dense globose heads. Flowers white. Early.

FAMILY 31 (Meliaceae)

70. *Melia azedarach*. Chinaberry tree. Bark furrowed. Leaves large, compound, twice or thrice pinnate. (Pl. II, fig. 8.) Flowers purple. Fruit a yellow drupe. The domestic form known as

the "Umbrella tree" is *Melia azedarach* var. *umbreculifera*, and differs from the wild form only in the shape of the top.

FAMILY 32 (Polygalaceae)

71. *Polygala alba*. Milk Wort. Erect herbs with white flowers composed of 5 unequal sepals, the two lateral ones being petal-like and larger than the others. Flowers small.
72. *Krameria secundiflora*. Sand burr. A small herb with a thick, woody root, the stems usually procumbent. Leaves narrow, lanceolate, tipped with minute spines. Flowers red. The flowers have a peculiar "two storied" appearance due to the fact that the sepals are colored inside and are much longer than the petals. Fruit is the familiar little sand burr. Late. (Pl. V, fig. 5.)

FAMILY 33 (Euphorbiaceae)

73. *Croton texensis*. Goat weed. Flowers greenish and of two sexes (pistillate and staminate). Plants shrubby with a distinct sage-like odor. Plants covered with minute hairs, arranged in star-like groups. Late.
74. *Euphorbia marginata*. (Dichrophyllum.) Snow-on-the-mountain. Tall erect herbs, the upper leaves with conspicuous white margins. Sap milky, flowers in small cup-shaped receptacles. Stems and pods hairy. Late.
75. *Euphorbia arkansana*. (Tithymalus)-Spurge. Plants small, inconspicuous, smooth, about 6 or 8 inches high. Flowers minute, greenish yellow. Fruit a 3-lobed warty capsule. (Pl. IV, fig. 11.)
76. *Jatropha stimulosa*. Bull nettle. Spurge nettle. Plants heavily armed with stinging spines. Leaves broad, 3-5 lobed, lobes toothed. Flowers large, white and in clusters. (Pl. VII, fig. 5.)

FAMILY 34 (Malvaceae)

- ✓* 77. *Callirhoe digitata*. Claret cup. Poppy mallow. "Hollyhock." Low trailing plants with conspicuous cup-like flowers. Flowers mostly reddish purple, but pure whites occur. Leaves arranged in 3-5 leaflets. Very abundant. (Pl. VI, fig. 5; Pl. IX, fig. 5.)
78. *Callirhoe involucrata*. Claret cup. Greatly resembling the above, but less common. Can be distinguished by the leaves which are broad and heart-shaped and divided by deep incisions into lobes, which in turn are divided into lobules. Flowers appear in late Spring or early Summer.

FAMILY 35 (Violaceae)

✓ 79. *Viola obliqua*. Woods violet. The common violet of the woods of this region. Leaves heart-shaped at the base, with toothed margins. Flowers blue to violet, about one inch long. Early. Fruit a many-seeded, 3-parted capsule (Pl. IV, fig. 8), which is not a part of the flower, but it is an entirely separate structure and appears much later than the flower.

✓ 80. *Viola rafinesquii*. Johnny-jump-up. Small plants with ovate leaves. Flowers small, blue. Much less common than the woods violet.

81. *Calceolaria verticillata*. Nodding violet. Sepals equal; petals, very unequal—the 2 upper smallest, the lower largest. Plants 6 to 12 inches tall, flowers very small bluish white in color.

FAMILY 36 (Cactaceae)

82. *Cactus sessilis*. Melon cactus. The common low cactus of the uplands. Stems usually branch into short dense tufts. Flowers large, yellow. Late.

83. *Opuntia macrorhiza*. Prickly pear. Stems arranged in flattened disks, which are fleshy, green and covered with sharp spines. (Pl. V, fig. 7.) Flowers large, rich yellow, with reddish centers. Late.

FAMILY 37 (Onagraceae)

Flowers yellow, petals four.

Flowers large, 3 inches or more. *Megapterium*

Flowers smaller, less than 2 inches.

Plant a low rosette *Lavauxia*

Plant a slender, erect stem *Meriolix*

Flowers white or pink, petals four.

Flowers small, unsymmetrical *Gaura*

Flowers large, symmetrical *Hartmannia*

84. *Megapterium missouriense*. Giant evening primrose. Flowers yellow, very large. Stem slightly hairy. Plants grow mainly on the uplands. (Pl. IV, fig. 13.)

✓ 85. *Lavauxia triloba*. Evening primrose. Flowers pale yellow. Leaves in basal rosettes. Leaves lanceolate, deeply incised. Plants grow mainly in the bottoms. Early. (Pl. IX, fig. 8.)

86. *Meriolix spinulosa*. Willow weed. Stems erect, often branching. Leaves lanceolate, toothed or incised. Flowers yellow. Very common on the uplands.

87. *Gaura drummondii*. Flowers small, pinkish, the petals stalked and

arranged in unsymmetrical groups. Leaves wavy toothed. Stem slightly hairy.

Hartmannia speciosa. Evening primrose. Flowers large, white, turning to pink.

FAMILY 38 (Umbelliferae)

✓ 89. *Phellopterus macrorhizus*. Indian potato. Flowers very small, white, in dense umbels. Leaves clustered. Plants low, less than 6 inches high. Roots with tubers. These flowers bloom very early and are usually first noticed in fruit. Early.

90. *Daucus pusillus*. Wild carrot. "Dart plant." Flowers small, white, and in dense disk-like umbels. Fruit bristly, in dense disk-like heads, slightly concave on the upper surface.

She
91. *Ptilimnium laciniatum*. Flattened umbels of small white flowers (Pl. IX, fig. 2.) Leaf in many finger-like divisions, each division being very narrow. Two sexes present, each in individual flowers. Plant stem "grooved." Late.

92. *Eryngium leavenworthii*. Plants thistle-like. Flowers in dense oval umbels. Flowers purple. Late. (Midsummer.)

93. *Chaerophyllum teinturieri*. Spanish needle. Flowers small, white, in loose open umbels. Fruit long, narrow. (Pl. IX, fig. 3.)

FAMILY 39 (Gentianaceae)

94. *Sabbatia campestris*. Rose pink. Small plants, rather pale green in color. Flowers bright pink or rose color, fragrant, with yellow centers and conspicuous stamens. Plants grow in dense clumps in low, marshy places. Not very common around the campus.

95. *Eustoma russellianum*. Texas Blue Bell. Plants two or three feet tall. Flowers large, showy, rich blue in color, tubular or bell shaped. Abundant in certain localities. Late.

FAMILY 40 (Apocynaceae)

✓ 96. *Amsonia texana*. Texas Blue-Star. Amsonia. Small, erect plants, growing in clumps on the uplands. Abundant. Flowers pale blue, petals 5. Leaves many on the stem. Juice milky. Early.

FAMILY 41 (Asclepiadaceae)

97. *Asclepias tuberosa*. Chiggerweed. Milkweed. Plants with masses of bright orange colored flowers. Stems with milky juice.

She
98. *Asclepiadora viridis*. Milkweed. Flowers green. Plants with sticky milky juice. Seed pods large. Seeds flat and provided with

tufts of cottony hairs. Leaves lanceolate or lance-shaped. (Pl. I, fig. 3). This is the common milkweed of this region.

99. *Asclepiadura decumbens*. Milkweed. Like above, but leaves heavy, ovate; and plant procumbent.
 100. *Vincetoxicum biflorum*. A shrubby vine. Flowers liver-colored, star-shaped, with 5 petals. Fruit thick, fleshy, oval, large, hairy. Leaf blades ovate, cordate at the base.

FAMILY 42 (Convolvulaceae)

✓101. *Evolvulus mollis*. Low branching plants with small pinkish flowers which are tubular or bell-shaped. Leaves linear. (Pl. I, fig. 4.) Plants grayish and silky.
fls 102. *Convolvulus hermannoides*. Wild Morning Glory. Trailing plants, with small pink to white flowers, having reddish centers. Leaves with wavy margins.

FAMILY 43 (Polemoniaceae)

fls 103. *Phlox pilosa*. Phlox. Sweet William. Plants small, erect. Flowers range in color from white to purple, salver-form. Leaves very narrow, opposite. Plants hairy.
 104. *Gilia rubra*. Flame Plant. Wild cypress. Erect plants, with conspicuous spikes of bright red flowers. Flowers small. Leaves numerous and finely dissected. Late.

FAMILY 44 (Hydrophyllaceae)

105. *Phacelia glabra*. Flowers salver-form. (Pl. VIII, fig. 10.) White to purple, mostly purple. Corolla fused at the base. Plants small. Leaves somewhat dissected, with serrate margins.
 106. *Phacelia imbricata*. Small white to purple flowers arranged in spirally coiled spikes.

FAMILY 45 (Boraginaceae)

✓107. *Lithospermum angustifolium*. Yellow puccoon. Flowers bright yellow, petals fusing into a long tube at the base. Petals crinkled at the edges. Leaves narrow and linear. Early.
 108. *Onosmodium molle*. Flowers white, very small. Ovary separating into 4 hard nutlets at maturity.

FAMILY 46 (Verbenaceae)

fls 109. *Verbena bipinnatifida*. Wild Verbena. Flowers small, lavender. Plants low, bushy. Stems with minute hairs, usually in 2's. Early.
 110. *Verbena officinalis*. Plants erect, stems often branching. Stems

only slightly hairy. Flowers arranged on a loose spike. Leaves deeply lobed, lobes in turn dissected.

111. *Phyla nodiflora*. Stems procumbent or trailing, and jointed, taking root at the joints. Leaves arranged in whorls around the stem at the joints. Flowers in small heads, white or pinkish in color, very small. Leaves spatulate to ovate, toothed along the margins. Plants very common, forming a carpet-like mat in moist places.

FAMILY 47 (Labiateae)

Flowers blue.

Plants densely hairy.

Plants small with long bristly hairs *Salviastrum*

Plants large, stem and calyx of flower covered
with white to violet hairs *Salvia*

Plants not densely hairy *Scutellaria*

Flowers pink to rose.

Leaves heart-shaped, edges notched, the upper leaves
clasping the stem. Flowers deep rose *Lamium*

Leaves narrowly lanceolate, edges toothed above the
middle, plants erect *Brazoria*

Leaves lanceolate, edges not toothed, plant strongly
aromatic *Hedeoma*

Flowers white.

Flowers in "terraces" clasping the stem *Monarda*

Flowers not in "terraces" *Melosmom*

112. *Salviastrum texanum*. Flowers blue. Plants covered with long white hairs. Corolla 2-lipped, the upper lip concave, much smaller than the 4-lobed lower lip. Calyx 2-lipped, the upper lip 3-lobed, erect and crest-like; lower lip 2-parted. Throat of the calyx densely bearded. Leaves linear.

113. *Salvia farinacea*. Blue salvia. Plants large, branching freely from the base and covered with white to lavender hairs. Flowers deep purplish blue. Corolla 2-lipped—the upper lip small, concave and covered with conspicuous purple hairs. Lower lip much larger than upper; 3-lobed, middle lobe notched. Calyx entire or faintly notched. Plants aromatic. Leaves linear to lanceolate.

this ✓ 114. *Scutellaria drummondii*. Plants not conspicuously hairy, small, much branched from the base. Flowers pale blue. Corolla 2-lipped, upper lip small, lower lip much larger, spreading 3-lobed, middle lobe notched. (Pl. VIII, fig. 2.) Calyx 2-lipped; upper

lip entire, erect and crest-like; lower lip sometimes slightly toothed, calyx closed after corolla has fallen off. Leaves oval.

115. *Lamium amplexicaule*. Pink skull cap. Plants weakly trailing. Upper leaves clasping the stem. Lower leaves heart-shaped, edges serrate. Plants sparingly hairy. Flowers small, rose colored, 2-lipped. Upper lip erect, deep rose color, hairy. Lower lip cleft and drooping, often spotted with red. Early Spring flower in yards and gardens.

116. *Brazoria scutelarioides*. Plants small, erect, single. Lower part of plant usually smooth, flowering parts bearing short, straight hairs. Flowers pink, spotted with red. Corolla 2-lipped, upper lip broad and concave, lower lip 3-lobed and spreading. Calyx 5-parted, upper 3 sepals joined near base, but spreading at tips; lower 2 sepals narrow and sharp pointed. Also united near the base. Leaves narrowly lanceolate, edges toothed above the middle.

117. *Hedeoma acinoides*. Lemon Mint. Pennyroyal. Plant small, 6 to 8 inches, with opposite, linear or linear-oblong leaves. Corolla pinkish. Plants having strong lemon-odor.

118. *Monarda clinopodioides*. (Pl. VIII, fig. 3.) Horse Mint. Rather large, erect plants, with pale bluish white flowers arranged in circular "terraces" around the stem. Bracts as well as flowers often colored. Leaves narrowly lanceolate, edges sparingly toothed. Plants strongly aromatic. Late.

119. *Melosmom laciniatum*. White Mint. Plants small, inconspicuous. Leaves 3 or 4-parted, and linear. Flowers axillary and greenish white. Flowers very irregular, lower petal being larger and more spreading than other 4. Stamens and style erect. Corolla tube flecked with purple and containing many white hairs.

FAMILY 48 (Solanaceae)

Flowers yellow.

Plants spiny, flowers rich yellow *Solanum rostratum*

Plants not spiny, flowers pale yellow *Physalis viscosa*

Flowers not yellow.

Leaves silvery hairy *Solanum eleagnifolium*

Leaves not silvery hairy.

Leaves incised, plants spiny *Solanum carolinense*

Leaves entire, plants not spiny *Solanum nigrum*

120. *Physalis viscosa*. Small plants with ovate leaves. Flowers greenish yellow with dark centers.

121. *Solanum rostratum*. Yellow Nightshade. "Nettle." Leaves oval, deeply lobed, hairy. Plant armed with many yellowish

spines. Flowers yellow, one stamen much larger than the others and beak-like. Late.

122. *Solanum eleagnifolium*. Silver Leaf Nightshade. Leaves finely hairy, with wavy margins. Flowers light blue in color.

123. *Solanum carolinense*. Horse Nettle. Leaves and stems spiny. Flowers blue to lavender. (Pl. I, fig. 9.)

124. *Solanum nigrum*. Black Nightshade. Leaves and stem smooth. Leaves ovate. Flowers small, white. Late.

FAMILY 49 (Scrophulariaceae and Acanthaceae)

Flowers blue.

Flowers small, $\frac{1}{2}$ inch or less; with spur.....*Linaria*

Flowers large, 1 inch or more; bell shaped, without

spur.

Pistil bearded*Penstemon*

Pistil not bearded.

Corolla flecked with purple, leaves slender...*Calophanes*

Corolla not flecked with purple, leaves large

and heart-shaped*Ruellia*

Flowers white or rose colored.

Flowers white, plants growing mostly in water....*Dianthera*

Flowers rose, surrounded by scarlet or rose-colored

bracts*Castilleja*

125. *Linaria texana*. Toad Flax. Slender plants with small blue flowers. Flowers with a 2-lipped corolla, with a spur at the base of the tube.

WIA 26. *Penstemon cobaea*. Beard Tongue. "Foxglove." Corolla tubular or bell shaped, blue to purple. Flowers large, 2 inches or more long. Plants abundant on the uplands in the late Spring. (Pl. VII, fig. 7.)

127. *Calophanes linearis*. Corolla flecked with purple. Leaves opposite, narrow. Plants about one foot tall. On rocky uplands in late Spring.

128. *Ruellia ciliosa*. Blue flowers, funnel-form, $\frac{1}{2}$ inch long. Plants small, hairy, leaves oblong. Calyx about half as long as the corolla.

129. *Ruellia strepens*. Like above, but larger and plants not hairy. In shady, rather moist places.

130. *Dianthera americana*. Water Willow. "Orchid." Erect herbs, growing in water or wet places. Flowers small, pale violet or

white. Corolla 4-parted; upper petal erect and notched; lower petal flecked with purple. Stamens 2. Leaves narrowly lanceolate. Late.

✓ 131. *Castilleja purpurea*. Indian Blanket. Painted cup. Small plants, erect with conspicuous scarlet bracts around the scarlet or rose-colored flowers. Early.

FAMILY 50 (Orobanchaceae)

132. *Thalesia uniflora*. "Beech drops." Entire plant flesh colored or white. Parasitic on other plants at the roots. Flowers white, tubular, terminal. Stamens 4. Late.

FAMILY 51 (Rubiaceae)

133. *Houstonia angustifolia*. Leaves linear; stems slender and branched. Flowers in clusters, small, pink. Late.

FAMILY 52 (Caprifoliaceae)

✓ 134. *Viburnum prunifolium*. Black Haw. A tall shrub or small tree. Leaves oval. Flowers small, white, and in large flattened bunches. Petals 5, stamens 5. Fruit a 1-seeded drupe with a hard stone, fruit purple-black. Early.

FAMILY 53 (Valerianaceae)

✓ 135. *Valerianella amarella*. Geometrical chickweed. Small plants with regular and "geometrical" branching in 2's. Flowers small, white.

FAMILY 54 (Curcurbitaceae)

136. *Cucurbita fetidissima*. "Gourd." Trailing, vine-like plants. Coarse large leaves. Large bright yellow flowers. Fruit spheroid, gourd-like, 2 to 4 inches in diameter. (Pl. V, fig. 2.) Late.

FAMILY 55 (Campanulaceae)

137. *Specularia perfoliata*. Venus' Looking Glass. Flowers purple, 5-lobed. Leaves simple, rough, heart-shaped, clasping the stem. Late.

FAMILY 56 (Compositae and allies)

Flower heads white.

Flowers 2 to 3 inches in diameter, plants coarse and
bristly Silphium

Flowers small, 2 inches or less in diameter.

Flower heads globose or rounding Marshallia
Flower heads not globose:

Plants lowly, 2 to 6 inches, covered with white

- woolly fibers, flowers having a "pitted" appearance *Filago*
- Plants 18 inches to 2 feet in height:
 - Flowers "daisy-like":
 - Plants strongly aromatic *Achillea*
 - Plants not aromatic *Erigeron*
 - Flowers not daisy-like, lacking ray flowers, and greenish white in color *Hymenopappus*
- Flower heads yellow:
 - The heads large, 3 inches or more in diameter *Helianthus*
 - The heads small, 2 inches or less:
 - Flowers pale yellow, juice of plant milky *Sitilias*
 - Flowers orange yellow, juice not milky:
 - Disk an elevated cone, brown in color. (Pl. VIII, fig. 8) *Dracopis*
 - Disk flat or nearly so. (Pl. VIII, fig. 9).
 - Disk flowers brown in color, the leaves finely dissected *Thelesperma*
 - Disk flowers yellow:
 - Plants tall, 4 or 5 feet:
 - Leaves spiny and arranged in a "north-south" direction on the stem *Silphium*
 - Leaves not spiny, but coarse and hairy; flowers greenish yellow, very inconspicuous; fruit a spiny burr *Xanthium*
 - Plants 3 feet or less in height:
 - Flowers characteristically having 5 yellow rays *Lindheimera*
 - Flowers with more than five rays:
 - Plants hairy:
 - Plants coarse, the leaves coarsely dissected *Engelmannia*
 - Plants low growing, the leaves narrow *Tetraneuris*
 - Plants not hairy:
 - Leaves dissected *Senecio*
 - Leaves linear *Amphiachrys*
 - Flower heads pink, blue, lavender or red:
 - Plants with spines, flowers bluish lavender *Carduus*
 - Plants without spines:
 - Flowers lavender *Centaurea*
 - Flowers pink or rose-colored *Brauneria*

Flowers bright red, the ends of the rays tipped with yellow Gaillardia

138. *Silphium albiflorum*. Coarse, rough plants with coarsely dissected leaves. Rays white. Fairly common on dry, rocky hillsides. Late.

139. *Silphium laciniatum*. Compass Plant. Tall, slender, rather spiny plants. Flower heads yellow. Leaves during the very dry summer weather take on a characteristic "north and south" direction. Late.

140. *Marshallia caespitosa*. Slender plants, leaves linear and mostly basal. Flowers small, white and in round or globose heads.

141. *Filago prolifera*. Indian tobacco. Small, inconspicuous plants, very abundant in dry waste ground. Stems and leaves white-woolly; flowers minute, "buried" in small woolly heads. Very common on north end of campus.

142. *Achillea millefolium*. Yarrow. Milfoil. Tall-growing aromatic plants, having finely dissected fern-like leaves. Flower-heads small and in flattened corymbs.

143. *Erigeron tenuis*. Slender Rough Fleabane. Fairly tall, branching plants, slightly hairy. Flower-heads distinctly daisy-like, with many fine white rays.

144. *Hymenopappus corymbosus*. Flower heads small, greenish white. Disk flowers perfect, no ray flowers. Involucres white. Stems and leaves "woolly."

145. *Helianthus annuus*. Sunflower. Rays yellow, disk dark purple or brown. Heads large, 4 inches or more across. Leaves toothed.

146. *Helianthus maximilianii*. Sunflower. Rays yellow, disk yellow. Leaves linear. Late.

✓ 147. *Sitilias multicaulis*. Dandelion. Flowers bright yellow, almost canary in color. Appearance like that of the common garden dandelion. Early

148. *Dracopis amplexicaulis*. (Rudbeckia amplexicaulis.) Clasping-Leaved Cone Flower. Rays yellow, usually with dark brown spots at the base of the rays. Disk an elevated brownish cone. (Pl. VIII, fig. 8.) Leaves broad and clasping the stem.

149. *Thelesperma trifidum*. Rays yellow, edges notched. Disk purplish brown. Leaves finely dissected. Very common.

150. *Xanthium speciosum*. Cockle Burr. Flowers yellow, small and inconspicuous. Plants bright green, with short coarse hairs.

✓ 151. *Lindheimera texana*. Texas Star. Plants lowly, with yellow

flowers, about one inch across. Rays yellow and few, usually 5. Bracts have minute stalked glands along the margins.

✓152. *Engelmannia pinnatifida*. Leaves deeply incised, the lobes in turn being toothed. Entire plant covered with bristly hairs. Flowers yellow and about one inch across.

153. *Tetraneuris linearis*. (Picradenia.) Leaves linear, forming basal rosettes. (Pl. II, fig. 8). Flower stem long, slender and leafless. Flower heads yellow, about 1 to 2 inches across. Very common or rocky hillsides in early Spring.

154. *Tetraneuris linearifolia*. (Picradenia.) Plants much smaller than above. Leaves linear, arranged alternately on the slender branching stems. Flower heads yellow, less than 1 inch across. Much less common than above, blooming in late Spring, usually.

✓155. *Senecio lobatus*. Groundsel. Plants tall, about 2 feet, smooth. Leaves much dissected and lobed. Flower heads small, $\frac{3}{4}$ inch or less; rays yellow, disk yellow. Plants showy.

156. *Amphyachyris dracunculoides*. Broom weed. August flower. Very common on upland prairies during late spring and summer. Plants about 2 feet high, leaves narrowly linear. Flower heads yellow, small, 1., inch or less across, numerous, on the ends of the branching stems. This plant contains a resinous sap, highly inflammable and constitutes a very real fire menace. This menace exists while the plants are still green, as the upper stems and flowers will burn with almost explosive violence at any time during the flowering season.

157. *Carduus virginiana*. Common Thistle. Heads lavender to purple. Leaves wavy and lobed, the lobes armed with long sharp spines. Plants bristly hairy.

158. *Centaurea americana*. Star Thistle. Heads lavender, altho whites and purples are found. Plants tall, 2 to 3 feet, leaves smooth and entire. Plants not spiny.

159. *Brauneria angustifolia*. (Echinacea.) Pink Cone Flower. Very showy plant. Rays rich pink or rose-color, disk elevated somewhat and purplish brown in color.

These ✓160. *Gaillardia pulchella*. Indian Daisy. Leaves lanceolate, deeply toothed. Flowers showy, with rays yellow at the apex and red at the base in typical forms. Pure reds, pure yellows, doubles and many other variations are found. These plants are extremely abundant in the late Spring and are found in clumps of many thousands on the uplands. This is easily the characteristic flower of the T. C. U. vicinity.

DIRECTIONS FOR PLANT COLLECTIONS

Each student is expected to present at the end of the term, a collection of twenty wild-flowers, neatly pressed and mounted. In making such a collection, there are several things for the student to bear in mind:

1. It is practically impossible to correctly identify a flower that has been pressed and dried. Bring in from the field at least two of every kind—one to press and one to identify. It is often necessary to tear up a flower in identification, hence the need of a margin.
2. Wherever possible, collect plants that have been in bloom long enough to develop fruits. This is important, because seeds are produced in a special organ, the ovary. In a newly open flower, this structure is so small that the unaided eye cannot make out the number of cells, seeds, etc. As these are factors which often form a basis for separation, the importance of seeing them clearly is obvious.
3. The root of a plant is often a basis for separation. Most of the Monocots and some Dicots have special root structures, which should be included in a pressed specimen.

To Press a Plant:

On a sheet of gray felt paper, place the plant in the desired position. Press gently with the fingers until the flowers and leaves lie flat.

If the leaves or flowers seem too thick, trim or pick out a few where they will not show.

When the plant has a thick bulbous or woody root, it may be trimmed away with a sharp knife on one side. Of course, in mounting, this cut side should be placed next to the paper.

Only the most general directions can be given for the actual pressing, as every student will have to learn by experience what procedure will give the best results. For each successful press there will be an inevitably large number of failures.

When the plants are small, several can be placed on the same sheet of felt. Take care, in such a group, to press only those plants having the same relative thickness. This will insure an equable distribution of pressure, and the results are bound to be more satisfactory than those obtained by a haphazard grouping.

After the plants are arranged satisfactorily, cover with another sheet of the felt and place in the plant press. Adjust the thumb-screws so that the contents are held firmly, but not mashed. Too much pressure does far more harm than not enough, and one careless individual can undo the work of several painstaking students, who, through necessity, are forced to share the press with him.

Remove the plants from the press after two or three days. If the plants have been pressed satisfactorily, they can be laid away between folded sheets of newspaper until thoroughly dry, and then mounted. Do not, under any circumstances, let the plants remain in the press longer than a week, as they are apt to mould or mildew.

Composites are most successfully pressed "face down," with all the ray flowers extended.

Many more flowers should be pressed and classified than the required twenty, as the percentage of failure is very high. This gives a margin from which to select the best twenty, as neatness is an important basis for grading.

To Mount:

L

Place the pressed plant on the blank sheet of mounting paper in the desired position. If the root, stem or seed pod has been cut to aid in pressing, place this surface next to the paper. Cut narrow strips from the roll of transparent tape that was issued with the other materials. Moisten the gum side and fasten the plant to the page at several critical points. (This tape may be used to cover very frail flowers that shed the petals readily.)

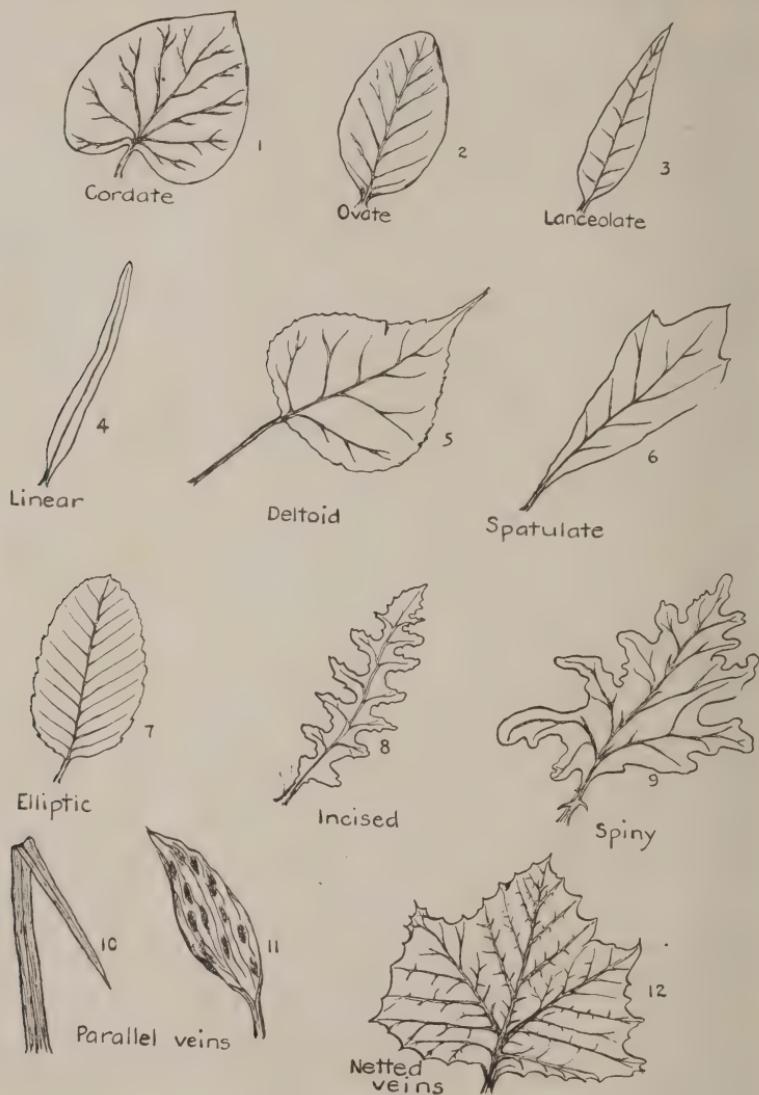
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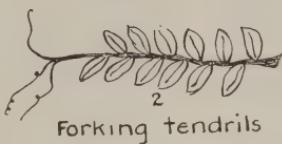
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Lithospermum	"	45	Poppy, Mexican.....	"	18
Lupinus	"	25	Populus	"	8
Marshallia	"	56	Prairie clover	"	25
Megapterium	"	37	Prickly pear	"	36
Melia	"	31	Primrose, Evening.....	"	37
Melosmom	"	47	Prosopis	"	23
Melon cactus.....	"	36	Prunus	"	21

	Page		Page
Psoralea	25	Sweet William	43
Ptilimnium	38	Sycamore	20
Puccoon	45	Tetraneuris	56
Quamash	2	Texas bluebell	39
Quamasia	2	Texas bluebonnet	25
Quercus	9	Texas star	56
Rain lilly	4	Thalesia	50
Redbud	24	Thelesperma	56
Redroot	30	Thistle	56
Rosa	21	Toad flax	49
Rose pink	39	Toxylon	11
Rubus	21	Tradescantia	1
Rudbeckia	56	Tree of Heaven	29
Ruellia	49	Ulmus	10
Sabbatia	39	Umbrella Tree	31
Salvia	47	Urtica	12
Salviastrum	47	Valerianella	53
Sand burr	32	Venus' looking glass	55
Sand plum	21	Verbena	46
Scrub elm	10	Vetch	25
Scutellaria	47	Viburnum	52
Senecio	56	Vicia	25
Sensitive pea	24	Vincetoxicum	41
Sensitive plant	23	Viola	35
Shepherd's purse	19	Violet, dog-toothed	2
Sheep sorrell	27	Violet, Woods	35
Silene	15	Viorna	16
Silphium	56	Water oak	9
Silver-leaf Night-shade	48	Water Willow	49
Sisyrinchium	5	White haw	22
Sitilias	56	White mint	47
Skull-cap	47	Whitlow grass	19
Sleepy catch-fly	15	Wild carrot	38
Smilax	3	Wild cypress	43
Snow-on-the-mountain	33	Wild geranium	26
Solanum	48	Wild "honeysuckle"	37
Sour grass, blue	27	Wild morning glory	42
Spanish needle	38	Wild Rose	21
Spanish dagger	2	Willow Weed	37
Spanish oak	9	Wind flower	16
Specularia	55	Winged elm	10
Spiderwort	1	Xanthium	56
Spurge	33	Xanthoxalis	27
Star Thistle	56	Yarrow	56
Stork bill	26	Yellow nightshade	48
Sunflower	56	Yucca	2





Pinnate



Forking tendrils



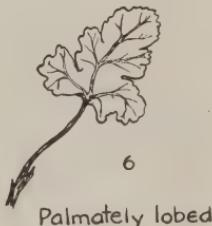
Palmate



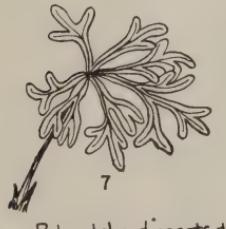
Trifoliate



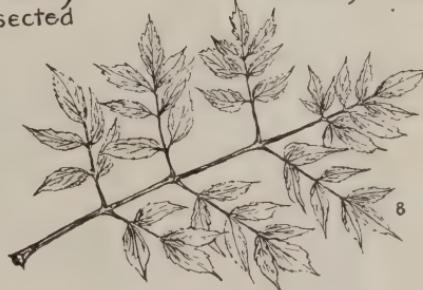
Pinnately dissected



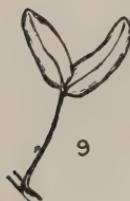
Palmately lobed



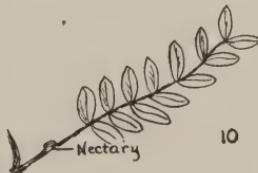
Palmately dissected



Doubly pinnate

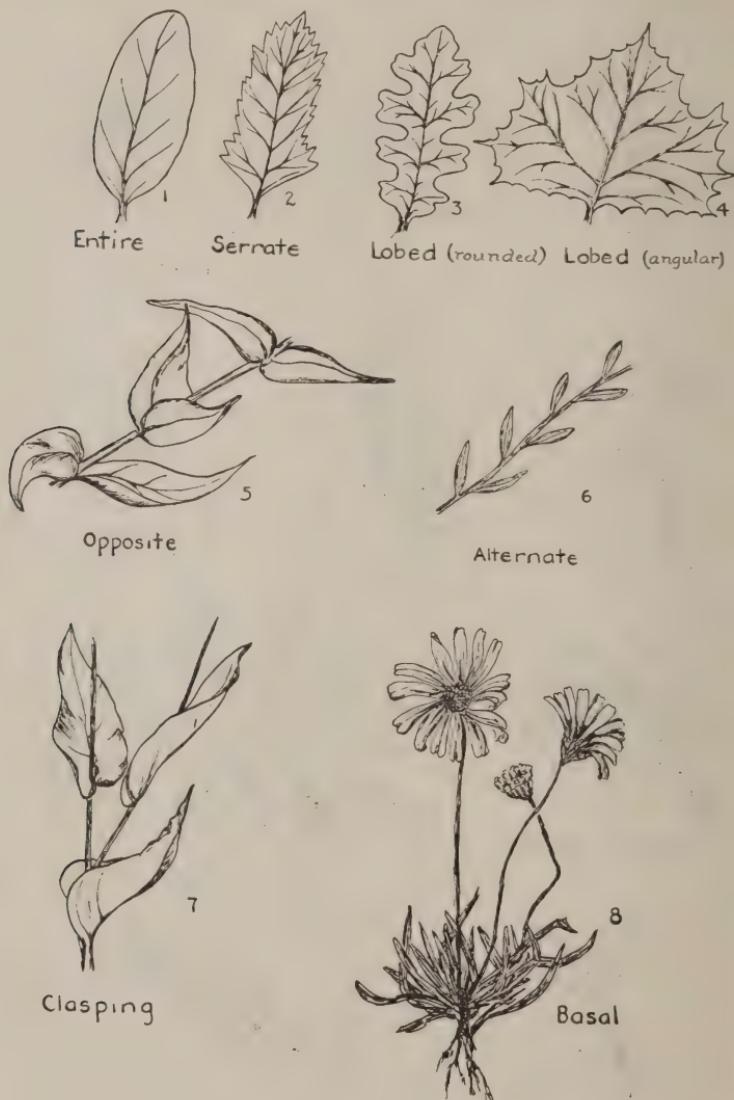


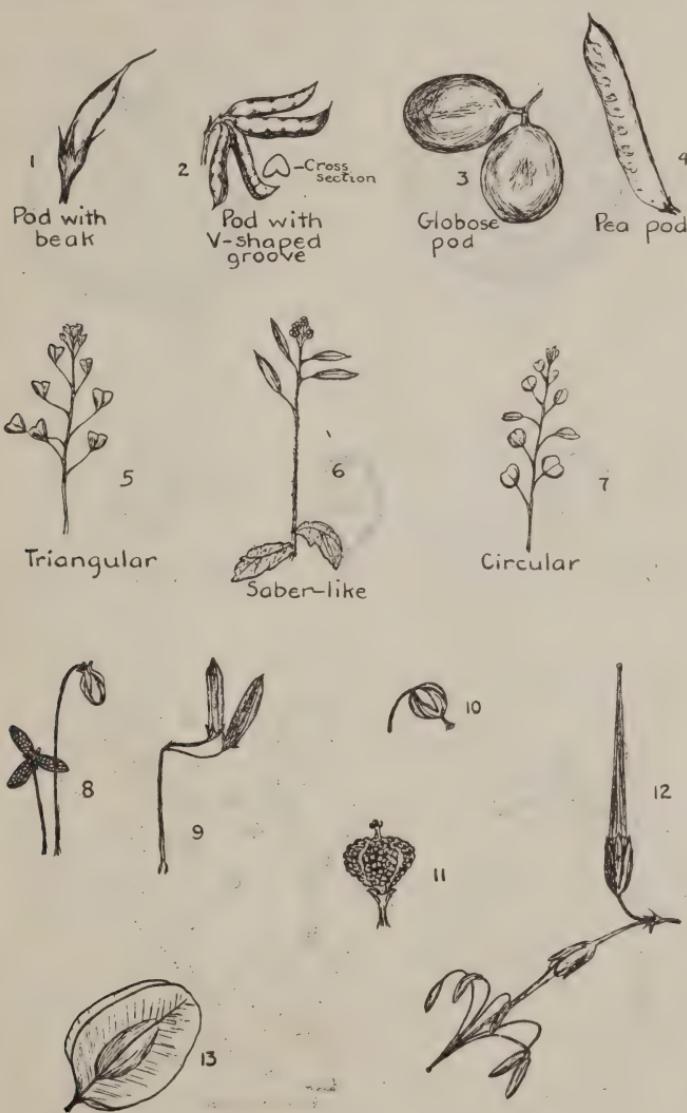
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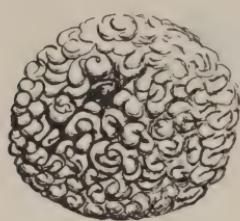


Nectary

10



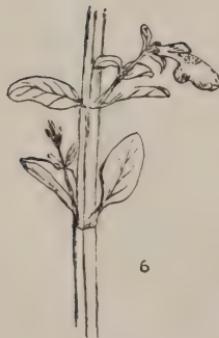




Typical drupe



Sand-burr



Plant stems
square

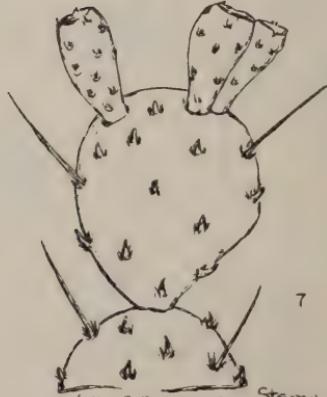
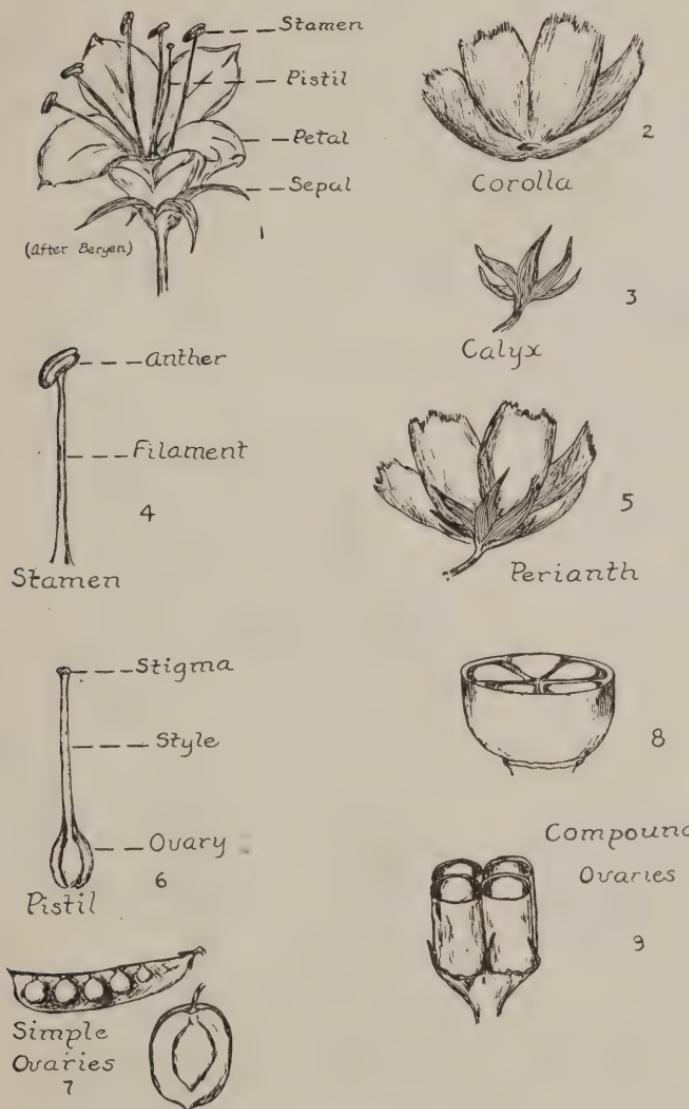
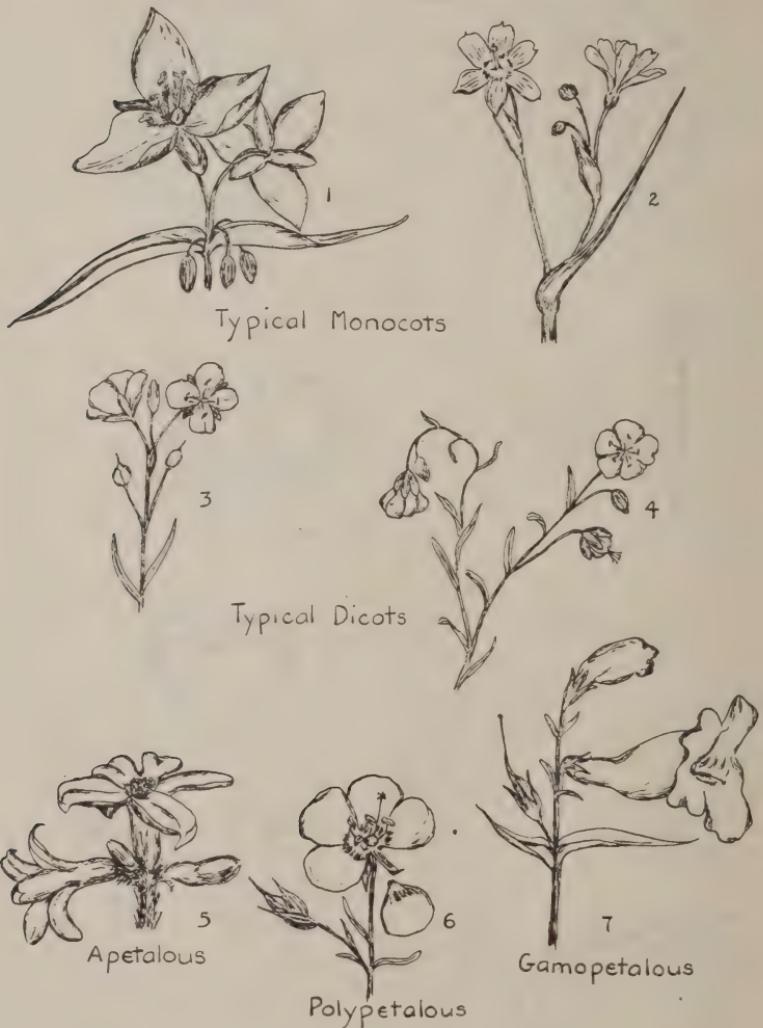


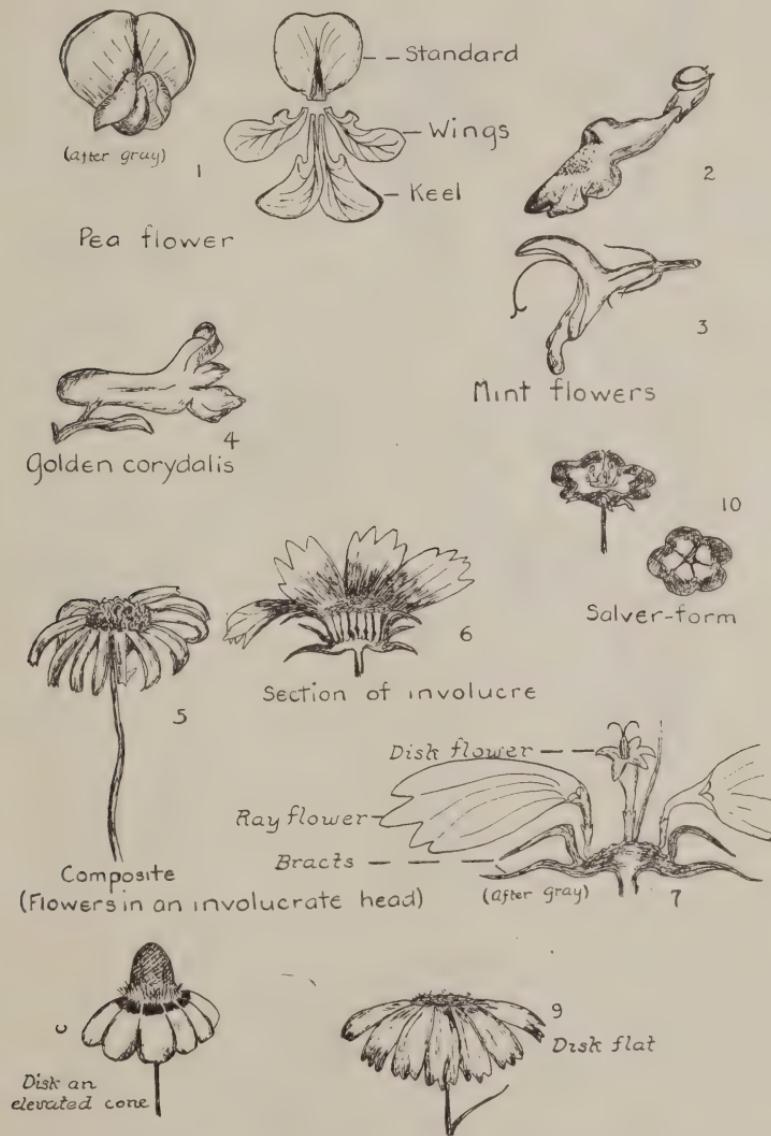
PLATE V.¹

(After Britton & Brown)

Stems in disks









Flowers in Umbels

Stamens
distinct

Stamens united



Stamens or receptacle



Stamens on Calyx



8

Ovary inferior



9

Ovary superior



10

Perianth attached to
ovary

Simple stigma



5-lobed

INSECTS

ARTIFICIAL KEY TO NINE COMMON ORDERS OF INSECTS

A. Insects with hard mouth parts, adapted for gnawing or biting, but not including forms with stabbing beaks.

Wingless insects. Small, flattened, pear-shaped bodies APTERA 1

Under pair of wings folded lengthwise under the upper pair. Incomplete metamorphosis.... ORTHOPTERA 2

Upper wings hard and shield-like. Lower wings folded both lengthwise and crosswise beneath the upper pair COLEOPTERA 3

All four wings nearly alike, fully veined and transparent.

(a) Hind wings slightly smaller than the fore, NEUROPTERA 4

(b) Hind wings equal to or larger than the fore ODONATA 5

B. Insects with soft mouth parts or with stabbing beaks.

The base of the upper wings leathery, and other half thin and membranous. Lower wings thin, translucent. The lips forming a tube or beak which is folded beneath the head HEMIPTERA 6

All four wings covered with dusty, downy scales. Jaws elongated into a sucking tube, which is coiled spirally beneath the head LEPIDOPTERA 7

(a) With knobs on the antennae, insects mostly diurnal Butterflies

(b) Without knobs on antennae, insects mostly nocturnal Moths

All four wings membranous (may be absent in worker castes). Hind wings locking with the fore along the edges. Mouth has lateral moving jaws as well as soft parts. The abdomen is usually provided with a sting HYMENOPTERA 8

Only the fore wings developed, the hind wings being represented by a pair of inconspicuous knobs. DIPTERA 9

Common or conspicuous examples found in the T. C. U. vicinity.

APTERA.

Silver Fish or Fish Moth (*Lepisma Saccharina*). Found in libraries. Feeds on the paste and sizing of books, on the paste of wall paper, etc.

ORTHOPTERA.

Grasshoppers. An unknown number of genera and species. Examples are the Lubber (*Brachypterus* sp.), which is very large and has very small wings; the Red Leg (*Melanopus femur rubrum*); the Red Wing (*Psinidia* sp.), which has bright red under wings exhibited only when flying; the Bird Locust (*Schistocerous* sp.), which is large and a very powerful flyer; the Spine Back (*Acridium* sp.), which has the triangular hard portion on the back extending beyond the soft parts of the abdomen.

Praying Mantids or "Devil Horses." A large green form (*Stagomantis* sp.), and a smaller brownish or straw-colored form (unidentified).

Katydid (*Pterophylla* sp.) green, with leaf-like wings.

Cockroaches. Two common forms, the small German roach or "Cotton Bug" (*Blattella germanica*), and the large American (*Periplaneta americana*).

Walking Stick Insect (*Diapheromera femorata*), a peculiar wingless form.

Mole Cricket (*Gryllotalpa* sp.), somewhat resembles a grasshopper, but has shovel-like front legs. An underground form, but fairly common.

Cricket (*Nemobrius* sp.). Brownish to black. Often migrates in great numbers.

COLEOPTERA.

May Beetle (*Lachnostenus arcuta*). Very common small brown beetle of summer. Its larvae are the familiar "grub worms" of this region.

Ground Beetle (*Lebia grandis*). Small. The anterior part of body reddish, the rest black or very dark brown.

Tiger Beetles (*Cicindela* sp.). Small, slender, very agile beetles. Many species. The most common are green with flecks of yellow. Common along the bank of the Clear Fork. Prey on gnats and other small insects.

Dung Beetles or "Tumble Bugs" (*Canthon* sp.). Black, oval-bodied. Roll a large ball of dung around the eggs. At least two species here.

Snout Beetle or Weevils, many genera and species. Great range in size and habits. All forms characterized by the snout.

Museum Beetles (*Dermestes* sp.). Minute beetles whose larvae do most of the damage (in this region) credited to the clothes moth.

Lady Beetles (*Coccinella* sp. *Adalia* sp., etc.). Very small spheroid forms, mostly reddish in color and spotted with black.

Water Beetles or "Whirligigs" (*Dysticus* sp.). Several species and sizes.

Borer Beetle (*Cylloepus robiniae*). Slender bodied; black with yellow markings.

Black Wood Beetle (*Possalus cornutus*). Large form, smooth thorax and corrugated wings. Powerful jaws.

Flour Beetle (*Tenebrio obscurus*). Much like above, but much smaller.

June "Bug" (*Macrodactylus spinosus*). Large, metallic bronze-green.

Smooth.

Caterpillar Hunter (*Calosoma scrutator*). Large green form, readily distinguished from the June Bug by its corrugated wings. This form is as useful as the June Bug is harmful.

Blister Beetles. Slender forms. Several species. (See museum specimens).

Goliathus Beetles. A very large brown oval-bodied beetle; found along the water courses in late spring and early summer.

NEUROPTERA.

May Fly (*Ephemera varia*), swarms in enormous numbers for a short time in the spring.

Ant Lion or "Doodle Bug." Several genera and species. The adults of this insect are seldom recognized as such, but are extremely common in spring and are very annoying at night.

Dobson Fly (*Corydalus* sp.). A large insect. Rare in this region, but extremely conspicuous on account of its size and its large jaws.

ODONATA.

Dragon Flies. An unknown number of genera and species along the water courses.

HEMIPTERA.

Note: All of the common members of the sub-order of the True Bugs have been collected and classified. To get species names, check your specimens against those in the museum.

Cicadas or "Locust." Several species. The Two-year form most common.

Plant Lice (*Aphis* sp.). Pink bodied insects, very small. Imbed themselves in masses of cotton down.

Water Striders (*Hygrotechus* sp.). Common aquatic insects which run on the surface of the water. Several species here.

Assassin Bugs. Black, red-spotted forms. All stab viciously. For names check against museum specimens.

Wheel Bug. (*Arillus cristatus*.) Large black bug, with a wheel-like crest on the back. Another stabbing form, whose victims usually refer their trouble to "spider bites."

Stink Bugs. Green and bronze forms. Strong aromatic odor on which they seem to depend mainly for protection, as they seldom bite. The stab is very painful, although seldom resorted to. *Nezera* sp. is the most common.

Electric Light Bug. (*Belastoma* sp.). The largest insect of this region. It is aquatic in habit, but flies at night and is attracted by strong lights.

LEPIDOPTERA

Butterflies

Monarch (*Anosia Plexippus*). Common large brown form with black markings.

Clouded Sulphurs (*Colias* sp.). Pale yellow, medium sized.

Papilios. Several forms. All rather large and characterized by the "tails" on the hind wings.

MOTHS

Sphinx or "Humming Bird" moth. (*Hemaris* sp.). Large, gray triangular bodies and wings.

Underwings and Cutworms. See museum specimens for names of most common.

Polyphemus. Several species with velvety wings and eye-like markings on the hind wings.

Tent Caterpillar Moth (*Malacosoma americana*). Small, reddish brown.

Borer Moths (*Sanninoidea* sp.). Small moths with the hind wings translucent. These insects are often not recognized by the beginner as moths. The larvae bore under the bark of trees, and are harmful.

HYMENOPTERA

Agricultural Ant. (*Pogonomyrmex occidentalis*). The large red ant. Very common.

Soldier Ant. Half red and half black.

House Ant. Small, red.

Bumble Bees (*Bombus* sp.). Several species, all black, marked with yellow.

Cow Killer Wasp. (*Sphaerophthalma* sp.). Large, red, hairy, wingless. Often mistaken for ant.

Tarantula Hawk. (*Pepsis formosa*). A gigantic red wasp. Dangerous, but good-natured.

Dirt Dauber Wasp. (*Pelopoeus* sp.) Build mud nests of several tubular cells.

Ichneumon Flies. Several genera and species. All with slender abdomens.

DIPTERA

House Fly (*Musca domestica*.)

Stable Fly (*Stomoxys calcitrans*). Much like above, but with a stabbing beak.

Horse Fly (*Tabanus* sp.). Very large form. Several species here.

Blow Fly (*Calliphora* sp.). Blue green.

Screw Worm Fly. Two flies which are so called. A small greenish fly (*Chrysomia macellaria*), which deposits eggs, and a large gray fly which deposits maggots. Both harmful.

Robber Flies. Powerful slender bodied flies which attack small insects.

Mosquitoes. Three forms. One diurnal (*Edes* sp.), and two nocturnal (*Culex* sp. and *Anopheles* sp.).

DIRECTIONS FOR INSECT COLLECTIONS.

The following materials are necessary for collecting: A bag of mosquito netting, or other close-mesh fabric, sewed on a wire hoop, which is attached to a handle three or four feet long; a wide-mouthed bottle, and a small bottle of gasoline or chloroform. The bottles will be issued to students, but the bag may be home-made or bought.

To Catch:

Most insects that fly rapidly, should be captured in the net. This includes Moths, Butterflies, Dragon-flies and some Grasshoppers.

Beetles, true Bugs and slower-moving forms are easily captured with the hands. Many of the true bugs have dangerous bites and caution should be exercised when handling them.

Insects with stings should be caught in the net, wrapped in a bit of cotton or cloth, and anesthetized with the killing fluid, after which they can be handled more freely.

To Kill:

Drop the insect in the wide-mouthed bottle, pour in a little gasoline or chloroform, and replace the cork. All insects may be killed this way except large beetles. To insure a quick and certain death, drop these into boiling water for ten or fifteen seconds.

Preparation of Specimens:

After insects are dead, but before they become stiff, remove from the bottle, and arrange for mounting. Beetles, true bugs, etc., do not require much preparation.

Lepidoptera, Odonata, Neuroptera, and many of the Orthoptera should be "spread" before mounted. Place such insects, back down, on a sheet of corrugated cardboard (such as that in which books and light-weight parcels are packed for shipping). Spread the wings and fasten with narrow strips of paper to the cardboard. Pin near the wing edges, but not thru them. In ten or twelve hours, the strips may be removed, and the insects mounted.

To Mount:

Thrust the point of an insect pin through the thorax of soft-bodied forms, such as butterflies, moths, etc. Raise the specimen to the middle of the pin or above.

Beetles are pinned through the right wing cover.

Small, soft specimens, such as silver-fish, may be glued to bits of stiff paper, and pinned through the paper.

Take care not to break off legs, antennae, etc., as all insects included in this collection should be as near perfect as possible.

To Arrange:

Group the insects according to orders. Print or typewrite the names of the orders on small labels, and paste in the bottom of the collection box.

Each student is expected to use his own judgment as to arrangement, etc., exercising care as to accuracy and neatness, however.

The requirement for Biology II, is a collection of twenty-five to forty insects, representing the nine common orders.

F OSSILS

COMMON FOSSILS OF THE T. C. U. VICINITY

PHYLUM PROTOZOA:

Colonial forms *Nodosaria*

PHYLUM COELENTERATA:

Corals:

Small, angular, less than 15 mm. in height..... *Placosmilia*
 Large, fairly smooth, 15 mm. or more in height..... *Parasmilia*

PHYLUM ECHINODERMATA:

Tests circular or nearly so:

Tubercles prominent.

More than 20 mm. across, no cap on apical system *Diplopodia*

Less than 20 mm. across, cap on apical system.

Cap circular *Salenia*

Cap pentagonal *Goniophorus*

Non-tuberculate, or tubercles minute *Holoclytus*

Tests heart-shaped or oval:

All pores in apical system slit-like.

Rays on surface, indistinct *Holaster*

Rays depressed, conspicuous *Hemaster*

Two rows of pores in each branch of apical system

slit-like, and two rows circular *Enallaster*

PHYLUM MOLLUSCOIDEA:

Bivalve, 10 mm. to 20 mm. across *Kingena*

Very fine net-like structure found on rocks and fossils *Bryozoa*

PHYLUM ANELIDA:

Worm-like fossils *Serpula*

PHYLUM ARTHROPODA:

Various claw-like structures *Crustacea*

*PHYLUM MOLLUSCA:*Class *Pelecypoda*.

Clams, valves symmetrical.

Large, more than 40 mm.

Circular or sub-circular.

Flat, smooth *Cyprimeria*

Growth lines in two directions *Protocardia*

Not circular.

Longest diameter from umbo to ventral margin, 80 mm. to 150 mm.

Prominent growth lines *Inoceramus*

Thin, smooth, razor-like, elongate *Gervilliosisps*

Small, less than 40 mm.

Ribs Prominent.

- Ribs entire *Lima*
- Ribs tuberculate *Venericardia*

Ribs not Prominent.

- Narrow hinge, fine growth lines *Nucula*
- Wide hinge, usually pyritized *Arca*

Valves unequal.

Valves ribbed.

- Ribs entire *Pecten*
- Ribs tuberculate *Plicatula*

Valves not ribbed.

- Prominent beak on one valve curved over the other *Gryphaea*
- Beak curved spirally or to one side *Exogyra*
- Valve without prominent beak *Ostrea*

Class Gastropoda.

Last whorl small.

- Low, 10 mm. to 15 mm. tall *Nerinea*
- Tall, 20 mm. to 40 mm. tall *Turritella*

Last whorl large.

- Low, whorls about three *Gyrodes*
- Tall, whorls four or more *Lunatia*

Class Cephalopoda.

Straight or only slightly curved *Hamites*

Coiled spirally *Turrilites*

Coiled in a plane.

More than 60 mm. across.

Without keel.

- Very large, complicated suture *Desmoceras*
- Simple suture *Nautilus*

With keel.

- Ribs large, straight and spoke-like *Schloenbachia*
- Ribs small, recurved and flat *Inflatoceras*

Less than 60 mm. across.

Prominent keel.

- Ribs large and tuberculate *Mortoniceras*

No keel.

- Ribs fine, numerous, non-tuberculate *Scaphites*

PHYLUM CHORDATA:

Teeth and vertebrae *Sharks*

NODOSARIA

1. *Nodosaria texana*. A colonial form, consisting of a linear series of collar-like chambers averaging about nine in number. The chambers increase slightly in size toward the mouth, which is terminal and consists of about four prominent apertures. Average thickness of fossil 1 mm.; average length, 5 mm.

PLACOSMILIA

2. *Placosmilia sp.* A small, tapering, exceedingly angular form, about 8 mm. tall and about 5 mm. across the top. Base marked by a small attachment scar.

PARASMILIA

3. *Parasmilia texana*. Large, simple and conical in form. Septa on the plan of six. Average height about 35 mm.; average measurement across top about 25 mm. At the base there is an attachment stalk, which is rarely preserved.

DIPLOPODIA

4. *Diplopodia texana*. Small, 20 mm. to 50 mm. across; low, biconcave, greatest concavity being on the ventral side. Several double rows of tubercles extending from the apical center over the peripheral edge to the ventral side. These double rows of tubercles are sometimes interspaced with a few scattered tubercles. No cap over apex.

SALENIA

5. *Salenia mexicana*. Almost spherical in form, covered with several rows of prominent tubercles. Apex covered with a distinct cap-like structure, in which the large anal pore is eccentrically located. Height about 9 mm., largest measurement about 14 mm.

GONIOPHORUS

6. *Goniophorus sp.* An echinoderm very much like *Salenia mexicana*, but smaller. Tubercles prominent; apical cap a five-pointed star in which the large anal pore is eccentrically located. About 2 mm. to 4 mm. tall, 4 mm. to 6 mm. across.

HOLECTYPUS

7. *Holectypus limitis*. A circular echinoderm, ventral side flat with large mouth opening. Dorsal side distinctly conical in shape. Surface smooth with the exception of rows of minute tubercles closely spaced. Height 10 mm. to 15 mm.; diameter of base 30 mm. to 50 mm.

HOLASTER

8. *Holaster simplex*. Base flat and heart-shaped; arms of apical system not in furrows, or in very shallow furrows. Fossil smooth, or covered only with small indistinct tubercles. Sides steep, anal pore posterior. Greatest measurements across base 50 mm. to 70 mm.; height, 20 mm. to 30 mm.

HEMIASTER

Large

Diameter 60 mm. to 100 mm. *Hemiaster elegans*

Small.

Less than 60 mm.

Relatively smooth, apical system well centered *Hemiaster whitei*

Tall, more symmetrical, apical system in deep incisions *Hemiaster calvini*

9. *Hemiaster elegans*. A very large flat echinoderm, base measuring 60 mm. to 100 mm. in diameter; height 30 mm. to 60 mm. Arms of apical system in moderately deep furrows. Center of apical system slightly anterior; mouth well forward; anal pore at extreme posterior end. This is the large flat biscuit urchin of the upper Duck Creek and Fort Worth formations.

10. *Hemiaster whitei*. Fossil moderately small; longest measurement across base 20 mm. to 30 mm.; height 15 mm. to 20 mm. This fossil is very much like *Hemiaster elegans*, but can be distinguished from it by its smaller size, shorter radial arms and more convex base. The posterior end is more truncate and the anal pore is higher than in *H. elegans*. The anterior sulcus is prominent, terminating in the mouth opening.

11. *Hemiaster calvini*. Sub-circular. Base measurement 15 mm. to 35 mm.; height 15 mm. to 30 mm. It is distinguished from *Hemiaster elegans* by its smaller size and greater relative height. It is distinguished from *Hemiaster whitei* and various other small Hemiasters by its greater height and its shorter radial arms, which are situated in deep grooves.

ENALLASTER

12. *Enallaster texanus*. Elongated posteriorly-anteriorly. Longest base measurement about 30 mm.; height 15 mm. to 20 mm. Center of apical system slightly posterior. Posterior end truncate, anal pore high. Most prominent distinguishing feature is the deeply depressed anterior groove.

KINGENA

13. *Kingena wacoensis*. The common small lamp-shell or brachiopod of this region. Occurs in the upper Duck Creek formation and in the Main street formation. Largest measurement 10 mm. to 20 mm. The ventral valve is longer, more convex than the dorsal, and has an aperture in the upturned beak. The dorsal valve is almost circular and has no beak.

BRYOZOA

14. *Bryozoa spp.* Fine net-like structures found on rocks and fossils. These forms are much alike to the casual observer, but represent many species of which only a few have been described. The most common genus is *Membranipora*.

SERPULA

15. *Serpula spp.* Worm-like fossils found cemented to rocks or free. They are distinctly worm-like, showing fine ring-like segments, and range in size from hair-like forms to 10 mm. in diameter. The *Serpulas* of this region represent many species, few of which have been described.

CRUSTACEAN GENERA

16. The crustacean fragments found in this region are mainly claws and claw parts, but sometimes tail parts and abdominal rings are found. Numerous species are represented by forms ranging in size from that of a small crayfish to that of large lobsters.

CYPRIMERIA

17. *Cyprimeria texana*. Large, flat, thin clam 50 mm. to 80 mm. across; and 10 mm. to 20 mm. in thickness; is almost circular; beak central, with very little, if any, hinge structure. Found usually as mud casts. There are various other species of *Cyprimeria* found throughout the Washita division of the Comanchean.

PROTOCARDIA

18. *Protocardia texana*. Recognized by its large inflated shell, bearing two kinds of striations. The most prominent of these are fine, concentric growth lines. The others occur at one end of the shell and are fine, radial or rib-like striations. The fossil has a prominent and centrally located umbo and a deep-set hinge; it is very thick in the region of the umbo, but has a thin and broadly rounded ventral margin. Dorsal to ventral margin 50 mm. to 80 mm.; thickness 35 mm. to 55 mm. Usually preserved as mud casts.

INOCERAMUS

19. *Inoceramus comancheanus*. Large clam; dorso-ventral axis greatly elongated, umbo centrally placed. Fossil can be recognized by its size, shape, and its fifteen to twenty raised and prominent concentric growth lines. Frequently a part of the original shell is preserved. Thickness near the region of the umbo about 60 mm.

GERVILLIOPSIS

20. *Gervilliopsis invaginata*. A razor-like clam, very thin, 50 mm. to 80 mm. long; 20 mm. to 30 mm. broad; umbo near one end. Usually found in conglomerates and can rarely be taken out entire. The shell is frequently pearly-iridescent.

LIMA

21. *Lima wacoensis*. Rectangular shell, considerably rounded at the corners. Usually about 30 mm. long and 20 mm. broad; umbo at upper anterior corner; thick near dorsal margin; ventral margin thin and broadly rounded. About twenty angular ribs radiate from the region of the umbo. Preserved as mud casts.

VENERICARDIA

22. *Venericardia wenoensis*. This clam has a blunt and rounded ventral margin; dorsal margin about umbo very thick. Shell is elongated from umbo to posterior ventral margin. Right valve slightly smaller than the left. Each valve has 18 to 20 fine radial ribs which are tuberculate, especially at the ventral ends. Thickest portion of shell about 15 mm.; length of ventral margin about 23 mm.; measurement from umbo to posterior ventral margin about 25 mm. Shell distinctly triangular.

NUCULA

23. *Nucula wenoensis*. Small, moderately inflated clam, smooth, but showing fine growth lines. Umbo considerably to the anterior of the middle of the shell. Ventral margin sharp and rounded. Measurements, umbo to ventral margin 14 mm.; posterior to anterior margin 20 mm.; thickness 9 mm. Hinge long and extended posteriorly. Hinge teeth impressions often present.

ARCA

24. *Arca washitaensis*. Length 9 mm. Height 8 mm. Thickness 8 mm. Shell inflated and smooth, with the exception of fine radial ribs. Umbo anterior to middle of shell. Hinge very wide, each umbo being curved in like a beak. Usually preserved in pyrite.

PECTEN

Ribs small *Pecten bellula*
 Ribs large with two secondary ribs between each pair of primary ribs.
 Ribs flat topped *Pecten texanus*
 Ribs angular *Pecten subalpina*
 Primary ribs bearing one or two tertiary ribs. *Pecten irregularis*
 All ribs grooved *Pecten georgetownensis*

25. *Pecten bellula*. Right valve flat. Left valve curved and inflated, almost symmetrical and marked by many fine ribs. Measurements, umbo to ventral margin about 25 mm.; posterior to anterior margin about 20 mm.; thickness about 13 mm.

26. *Pecten texanus*. This is a broad, low pecten with flat-topped ribs, the primaries being slightly higher and wider than the secondaries. The greatest measurement of the fossil is from 50 mm. to 75 mm. Chord of ventral margin 40 mm. to 60 mm. Found high in the Comanchean column.

27. *Pecten subalpina*. Much like *P. texanus*, but more common. It is distinguished by the height and angularity of both its primary and secondary ribs. Unless the ribs are distinctly flat topped the fossil is called *P. subalpina*.

28. *Pecten irregularis*. Like *P. subalpina*, except that it is smaller, its greatest measurement being about 30 mm. It is distinguished from *P. subalpina* by the fact that each primary rib has at its sides either one or two tertiary ribs.

29. *Pecten georgetownensis*. Clearly distinguished from other pectens of this region by the fact that all ribs, both primary and secondary, are grooved.

PLICATULA

30. *Plicatula dentonensis*. Probably the most abundant and widespread fossil of the Comanchean series. Ranges in size from a diameter of 5 mm. to 25 mm. It also ranges from smooth, finely ribbed non-tuberculate, showing few growth lines, to rough, coarsely ribbed and tuberculate, showing broad growth lines. It is cat-paw-like in appearance and locally is given the name of "cat-paw-clam." (See Pl. X.)

GRYPHEA

31. *Gryphaea washitaensis*. A thin shell with wide flaring wings. The beak is curved over the flat right valve. Measurement, umbo to ventral margin about 30 mm. Lateral measurement about 30 mm.

32. *Gryphaea marcoui*. Forms a conglomerate at the top of the Walnut formation. The beak is sharply curved toward the small right valve. On the larger valve there is a deep sinus extending from the beak to the ventral margin. Greatest measurement from beak to ventral margin is about 50 mm.
33. *Gryphaea navia*. Much like *G. marcoui*, but more ponderous, rougher, and the very sharp beak is curved toward a side. Shell is considerably flared at the ventral margin on the sinus side only. Greatest measurement from curve above beak to ventral margin about 70 mm. to 80 mm.

EXOGYRA

34. *Exogyra plexa*. Small. Greatest length about 20 mm. The beak is curved squarely around to one side, and there is an angular ridge around the top of the upper valve.
35. *Exogyra texana*. Considerably larger than *Exogyra plexa* and is oval. Varies considerably in size, but a good average is about 50 mm. for the longest measurement. It has a closely coiled beak which usually bears a small attachment scar. Shell very rough. Ventral margin thick; dorsal margin thin.
36. *Exogyra arietina*. Beak of left valve coiled in a spiral. Size intermediate between *Exogyra plexa* and *Exogyra texana*. Greatest measurement about 30 mm.

OSTREA

37. *Ostrea carinata*. Valves almost equal. Each elevated, elongated, and curved to form almost a semi-circle, the average cord of which is about 55 mm. The size, however, is variable. Shell deeply incised.

NERINA

38. *Nerinea sp.* There are probably many species of Nerinea in this region. They are small, closely coiled gastropods usually preserved in pyrite. Number of coils 6 to 10. Height of spire about 13 mm. Width of base about 8 mm.

TURRITELLA

39. *Turritella sp.* A number of species in the Weno formation. Small, sharply spired gastropods of about six whorls. On the whorls and running parallel to them is a series of seven to ten fine rows of tubercles, giving a granular appearance to the shell. These fossils range greatly in size, but are usually not more than 36 mm. in height, and the last whorl not more than 12 mm. in diameter..

GYRODES

40. *Gyrodes sp.* Large, low, coiled gastropod having three or four whorls. Last whorl relatively large. Height about 32 mm. Diameter of last whorl about 50 mm.

LUNATIA

41. *Lunatia sp.* Large spiral gastropod, resembling two cones with bases placed together; the basal whorl representing one cone and the other whorls in the spire representing the other cone. Whorls usually six, greatly increasing in size toward the last, and each almost engulfing the preceding. Height about 71 mm. Greatest thickness about 45 mm.

HAMITES

42. *Hamites comanchensis*. A medium sized curved Ammonite, the curve being a full half-circle. It is slender and has prominent, evenly spaced ribs with no prominent tubercles. Considerably flattened, usually fragmentary and preserved as a mud cast. Dorsal measurement about 18 mm. Bilateral measurement about 11 mm.

34. *Hamites fremonti*. Somewhat larger than *H. comanchensis* and hook shaped, the large arm shorter than the small arm. Ribs prominent except on the venter and irregularly tuberculate. Dorsal measurement about 25 mm. to 35 mm. Thickness 18 mm. to 25 mm. Usually fragmentary and preserved as mud casts. Distinguished from *H. comanchensis* by its size, curvature and ribs.

TURRILITES

44. *Turrilites brazoensis*. Large spirally coiled Ammonite with prominent tubercles. Average height of spire about 225 mm. Average diameter of last whorl about 100 mm.

45. *Turrilites worthensis*. Small spirally coiled Ammonite of about six whorls. Each whorl contains about five rows of small but prominent tubercles. Average height of spire about 15 mm. Average diameter of last whorl about 10 mm. Size may vary considerably. Usually preserved in pyrite.

DESMOCERAS

46. *Desmoceras brazoense*. The largest Ammonite of the region. Has a complicated suture pattern which is more often visible in the juvenile than in the adult. There are no ribs on the juvenile form, but on the adult there are large non-tuberculated ribs. Maximum breadth of shell 300 mm. to 500 mm. Thickness about 100 mm.

SCHLOENBACHIA

47. *Schloenbachia leonensis*. Shell large and convex. Ribs heavy and separated by an interspace about twice the width of a rib. Each rib ending in a large conical tubercle. Keel prominent and rounded. Maximum measurement across about 400 mm.
48. *Schloenbachia trinodosa*. Shell large and convex. Ribs heavy and separated by interspaces about two and one-half times the width of a rib. Each rib with three large conical tubercles. Average measurement across 150 mm. to 400 mm.
49. *Schloenbachia wintoni*. Shell convex, ribs heavy. Each rib ending in tubercles. The outer tubercle is distinctly notched or doubled, which is a distinguishing mark. Average diameter about 120 mm.

INFLATOCERAS

50. *Inflatoceras acuto-carinata*. Shell flat and compressed with slightly convex sides. Keel extended and sharp. Ribs numerous, small, flat topped. Greatest diameter 150 mm. to 300 mm.
51. *Inflatoceras bellnapi*. Shell moderately convex. Keel inconspicuous. Ribs much like those of *acuto-carinata*, except that they are larger, more rounded and have wider interspaces. Average diameter about 350 mm. Usually preserved as fragmental mud casts, characteristically iron stained.

NAUTILUS

52. *Nautilus texanus*. Much like modern nautilus. Shell greatly inflated and rounded. Outer whorl increases rapidly in size. No keel, tubercles or ribs. Usually a simple gently curved suture pattern. Preserved as a mud cast. Greatest diameter about 140 mm.

MORTONICERAS

53. *Mortoniceras worthense*. An Ammonite greatly resembling *S. leonensis*, except that it is small and usually preserved in pyrite. Ribs are prominent and wide apart. Bold tubercles occur near the outer ends of the ribs, producing a shoulder-like effect on the sides of the sharp, prominent keel. Diameter about 8 mm.

SCAPHITES

54. *Scaphites worthensis*. Small, much inflated; no keel; fine ribs placed together. Mouth opening almost a circle. Usually preserved in pyrite. Average diameter about 6 mm.

CHORDATA

55. *Teeth and vertebrae.* Shark teeth and vertebrae. The sharp, always well preserved teeth found throughout the region. Vertebrae are usually small, biconcave and preserved singly.

FUCIOD PLANT MATERIAL

56. Large masses of almost indistinguishable plant material found throughout the more impure limestones of the region. Sometimes the individual pieces are small, sometimes massive and branched.

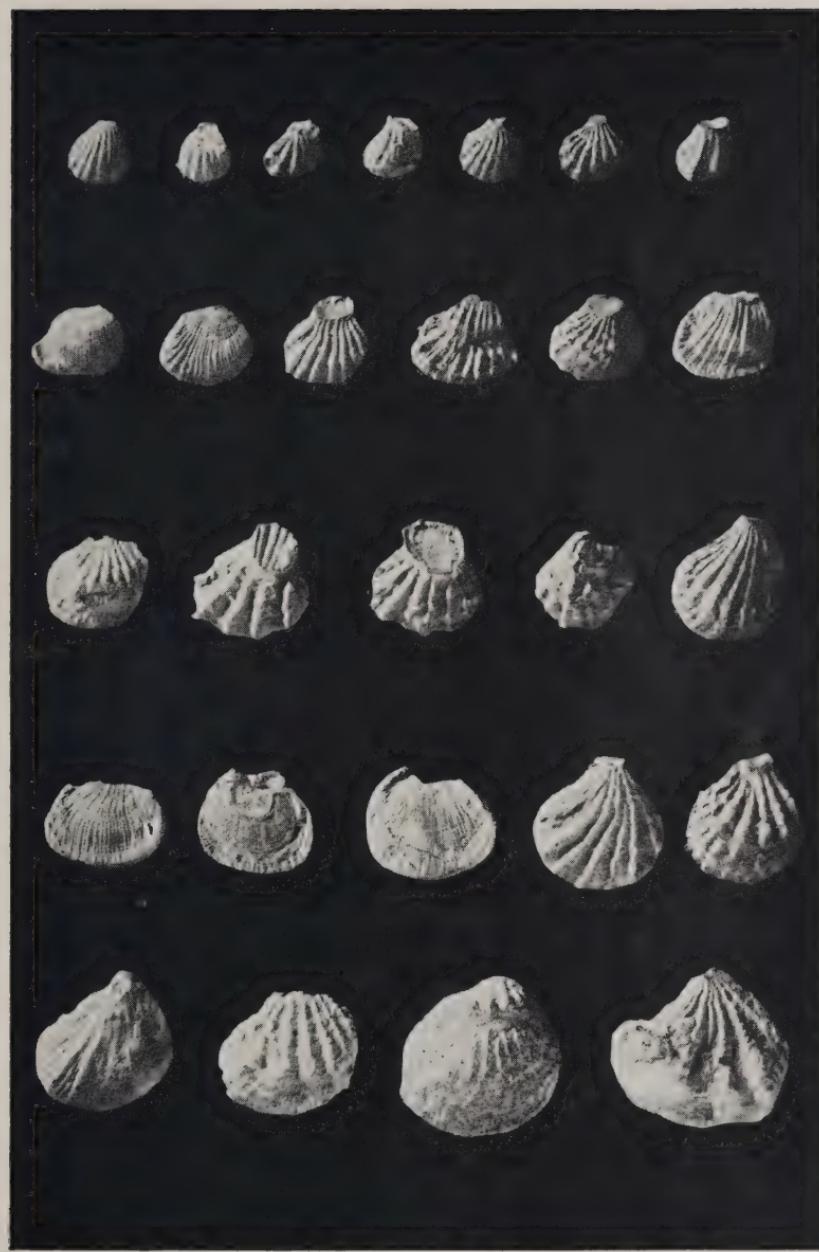


PLATE X.

THE "CAT'S PAW CLAM" (*Plicatula dentonensis*).

This extremely variable fossil occurs in all of the geological formations of the area and is the most common species.

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BIRDS

FORTY COMMON OR CONSPICUOUS BIRDS

1. Blue Heron
2. Kill-Deer
3. Bob White
4. Mourning Dove
5. Turkey Vulture
6. Black Vulture
7. Sparrow Hawk
8. Red Tailed Hawk
9. American Barn Owl
10. Screech Owl
11. Burrowing Owl
12. Road Runner
13. Rain Crow
14. Belted Kingfisher
15. Ladder Backed Woodpecker
16. Red Headed Woodpecker
17. Flicker
18. Night Hawk
19. Ruby Throat Hummingbird
20. Scissor-tailed Flycatcher
21. Blue Jay
22. Kingbird (Bee Martin)
23. Crested Flycatcher
24. American Crow
25. Cow Bird
26. Red Winged Blackbird
27. Meadow Lark
28. Orchard Oriole
29. Purple Grackle
30. English Sparrow
31. Lark Sparrow
32. Cardinal
33. Painted Bunting
34. Blue winged Warbler
35. Chickadee
36. Blue Bird
37. Mockingbird
38. Carolina Wren
39. Butcher Bird
40. Bittern

Key to Sizes:

VERY SMALL. Length under six inches. Birds distinctly smaller than the English sparrow.

Ruby-throat Hummingbird	Blue winged Warbler
Painted Bunting	Chickadee
Blue Bird	Carolina Wren

SMALL. Length six to eight inches. Birds the size of an English sparrow or slightly larger.

Screech Owl	Red winged Blackbird
Ladder backed Woodpecker	Orchard Oriole
Scissor tailed Flycatcher	English Sparrow
Bee Martin	Lark Sparrow
Crested Flycatcher	Blue Bird
Cow Blackbird	

AVERAGE. Length eight to twelve inches. Birds the size of a Mockingbird or slightly larger.

Kill-Deer	Night Hawk
Bob White	Blue Jay
Mourning Dove	Meadow Lark
Sparrow Hawk	Cardinal

Burrowing Owl

Mockingbird

Rain Crow

Butcher Bird

Red headed Woodpecker

Flicker

LARGE. Length twelve to twenty inches. Birds the size of a Crow or slightly smaller.

Rain Crow

Crow

Belted Kingfisher

Grackle

Flicker

VERY LARGE. Length twenty to forty inches. Birds conspicuously larger than a Crow.

Blue Heron

American Barn Owl

Turkey Buzzard

Road Runner

Black Buzzard

Bittern

Red Tailed Hawk

Key to Colors:

RED appearing conspicuously in the plumage.

Red-headed Woodpecker

Ruby-throat Hummingbird

Red winged Blackbird

Cardinal

Painted Bunting

YELLOW or ORANGE appearing conspicuously in the plumage:

Flicker

Scissor tailed Flycatcher

Meadow Lark

Orchard Oriole

Blue winged Warbler

BLUE appearing conspicuously in the plumage:

Blue Heron

Belted Kingfisher

Blue Jay

Painted Bunting

Blue Winged Warbler

Blue Bird

BLACK plumage or mainly black:

Black Buzzard

Crow

Cow Bird


3 0112 105956798

Red Winged Blackbird
Grackle

GRAY predominant in the plumage:

American Barn Owl
Screech Owl
Road Runner
Ladder Backed Woodpecker
Night Hawk
Scissor Tailed Flycatcher
Mocking Bird
Butcher Bird

BROWN predominant in the plumage:

Mourning Dove
Burrowing Owl
Rain Crow